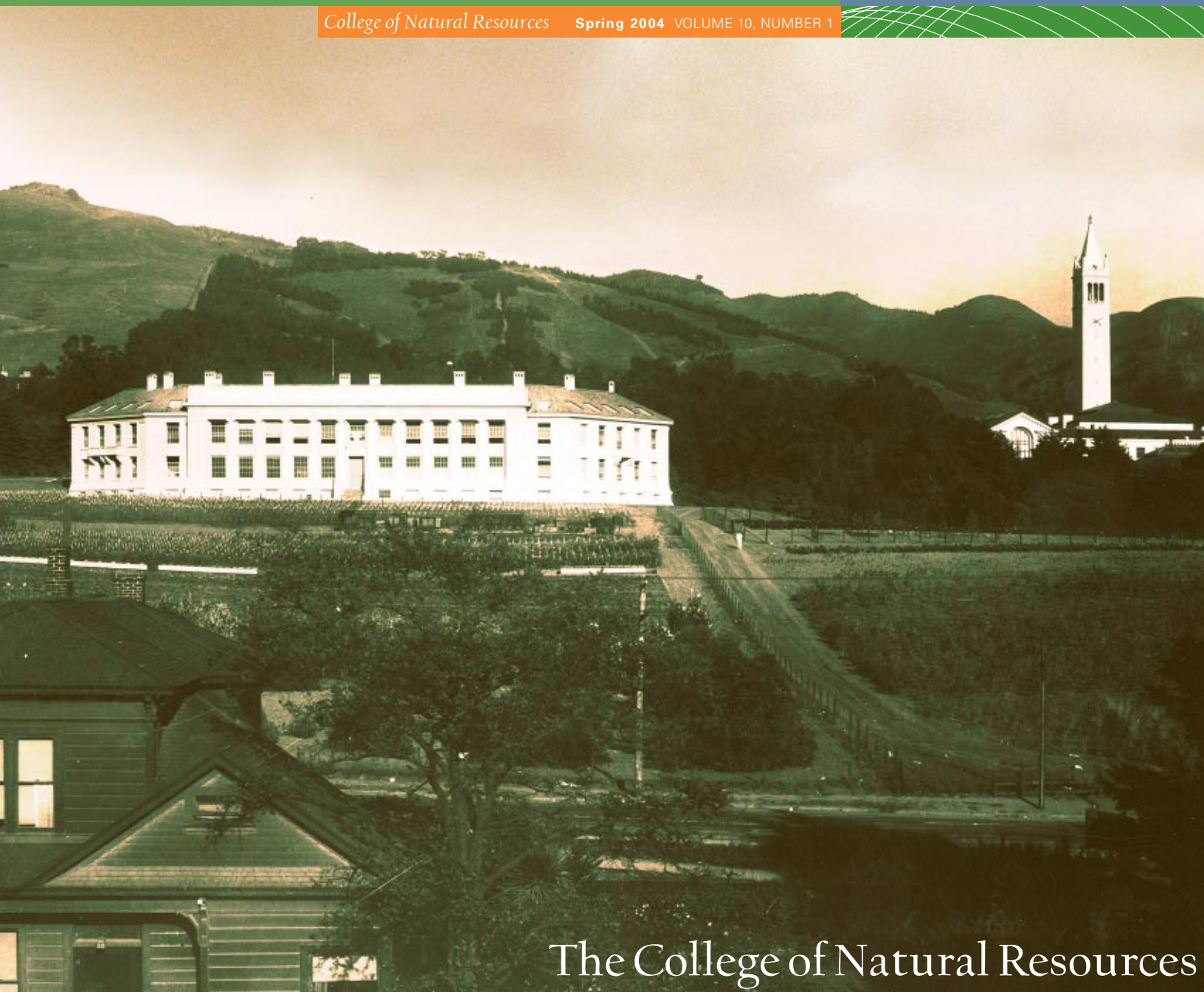


BREAKTHROUGHS

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of the College of Natural Resources,
University of California, Berkeley

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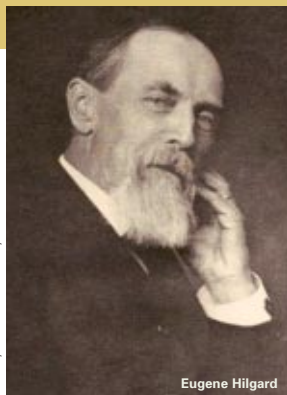
The College of Natural Resources

Reaches 30 Years

SPECIAL ANNIVERSARY ISSUE

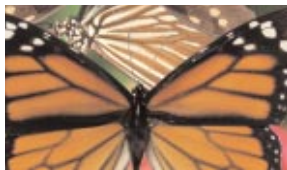


in this issue



Eugene Hilgard

Courtesy of the Bancroft Library



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online features.

Cover photographs:
Hilgard Hall, research crop growing area, and forestry
laboratory, circa 1917, courtesy of the Biosciences Library.

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DEAN
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A Note from the Dean

THE COLLEGE OF NATURAL RESOURCES: AN ONGOING, SUCCESSFUL EXPERIMENT

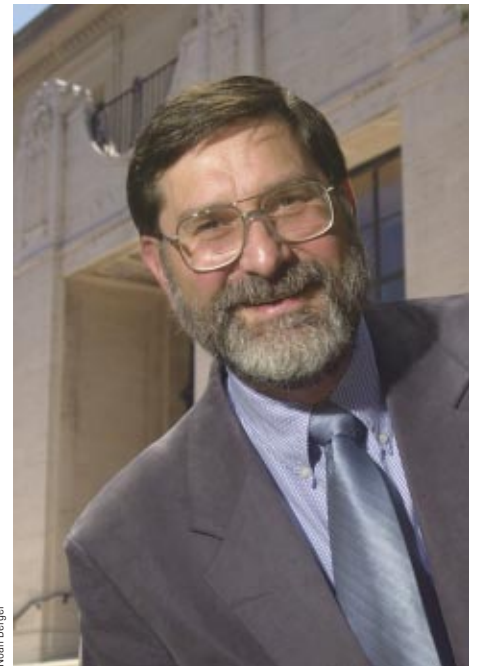
Shortly after 9:00 a.m. on July 1, 1974, the first meeting of the faculty of the College of Natural Resources was called to order in Birge Hall by Chairman Rudy F. Grah. Among the announcements were the selection of Loy L. Sammet as Acting Dean of the new college and the reading of a directive by Chancellor Bowker establishing the College of Natural Resources, and designating Giannini Hall as its administrative home. Chancellor Bowker's directive was the culmination of at least three years of work by the College of Natural Resources Organizing Committee, chaired by professors J. N. Boles and Grah. The merger of the College of Agricultural Sciences with the School of Forestry and Conservation to create CNR had its roots in the Berkeley campus's Revised Academic Plan of 1969-1975, which called for their "integration into a comprehensive educational program dedicated to the exploration of land resource questions."

John Zivnuska and E. G. Linsley, the last deans of Forestry and Agricultural Sciences respectively, forged a remarkable collaboration to bring forth a college that would respond to the environmental and resource issues of the state. Suggested names for the new college included "The College of Renewable Resource Management" and "The College of BioResources." In hindsight, neither of these seems as appropriate as the one selected. The College of Natural Resources has grown into its name and its role—on the Berkeley campus, within the UC system, and nationally.

Many of the production aspects of agriculture had been transferred to the Davis campus, but Berkeley continued at that time and continues today to play a vital role in resource issues related to agricultural lands and the entire resource base of the state. Without the foresight of Zivnuska, Linsley, Boles, Grah, and many other College and University leaders, it is unlikely that a department such as Environmental Science, Policy, and Management could have been imagined or formed in the reorganization of CNR that took place a dozen years ago. Similarly, our departments of Plant and Microbial Biology, Agricultural and Resource Economics, and Nutritional Sciences and Toxicology are recognized leaders in their fields and at Berkeley.

Today, our college remains an experiment. New majors in Molecular Toxicology, Microbial Biology, Environmental Sciences, and Molecular Environmental Biology have been added to provide students with training for an ever-changing world. Our Environmental Economics and Policy major has been opened up to students from the College of Letters and Sciences. CNR has just hired the first professor of bioethics at the Berkeley campus. These changes will ensure that the College continues to attract the finest students.

While College leaders at the time of the formation of CNR could not have anticipated the advances in genetics, remote sensing, economic theory, and nutrition that have occurred, they did recognize that change is a constant, and they designed a college to



Noah Berger

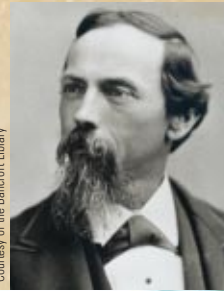
Paul W. Linsley

embrace whatever changes occurred. They could not have anticipated the controversies over GMOs, the role of corporate funding in research, or forest and fire management practices, but they recognized that Berkeley is a place where all sides are heard, issues are debated, and ideas are molded. They could not have imagined the cycles of budget difficulties that have left the College with far fewer financial resources, but they infused a culture of excellence and scholarship that survives those challenges.

The experiment continues, and CNR, with its roots as the first college of the UC Berkeley campus, continues to reshape itself to serve the students and the citizens of California. Zivnuska imagined a college that would "embrace the environment in which man lives and the biological, technical, and social processes that man uses to produce the food, fiber, and other materials that he requires." Were he looking today, he would note that more than half of our students are not "he," but "she," and that the College serves all of humankind. And he would be proud. 🚩



Courtesy of the Biosciences Library



Courtesy of the Bancroft Library

Left: College of Agriculture 1920 graduation.
Right: Eugene W. Hilgard set forth a vision of excellence for the College of Agriculture that continues today within the College of Natural Resources.



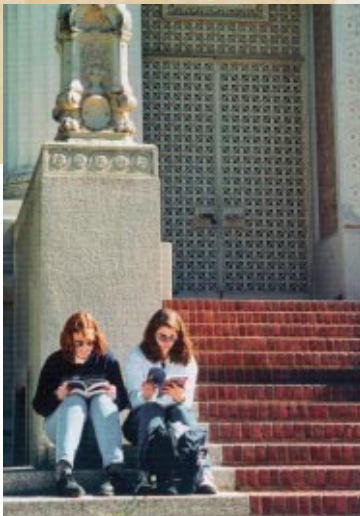
CELEBRATING OUR PAST AND OUR FUTURE:

The College of Natural Resources Reaches 30 Years



Peg Skorpinski

Above: College of Natural Resources 2003 commencement.
Center: Modern-day photograph of buildings known as the Agriculture Group: Hilgard Hall (left), Wellman Hall (center), and Giannini Hall (right, behind trees).



Students on the steps of Hilgard Hall.

SINCE ITS CREATION, THE COLLEGE HAS BROUGHT the intellectual power of academia to the practical problems of society. This year, we celebrate our 30th anniversary as the College of Natural Resources.

While two-thirds of our living alumni graduated from the College under this appellation, CNR is only one milestone in a long tradition.

Eugene Hilgard and the College of Agriculture

The College dates back to the original charter of the University of California in 1868.

The California Constitution of 1849 mentioned creation of a state university. But no action was taken until the passage of the 1862 Morrill Land Grant College Act, which offered federal land grants to states that established agricultural colleges. The state legislature officially created the Agricultural, Mining, and Mechanical Arts College in 1866 and began looking for a location to site the college.

Meanwhile, former Congregational minister Henry Durant founded the College of California in Oakland, with a curriculum modeled after Yale and Harvard. By 1867, the college was financially troubled, and trustees of both educational institutions agreed to combine their resources to form a “complete” university. In 1867, the College of California donated its land and dissolved the institution to merge with the newly formed agricultural college. In March 1868, the governor signed the Organic Act, establishing the University of California. The College of Agriculture was the first college established on campus. The new university was sited on 160 acres four miles north of the original College of California, in a place called Berkeley.

The College of Agriculture started slowly under its first dean, Ezra Carr. In 1875, however, Eugene Hilgard assumed leadership of the College and set forth a vision that remains today: bring the highest caliber of science to bear on practical problems and use this knowledge to train the leaders of the future. Born

in Bavaria and trained in Germany, Hilgard was a respected scientist and passionate educator. He realized that agriculture suffered a poor reputation among scholars as a scientific endeavor, while farmers simultaneously had little interest in academia.

His meticulous research categorizing the nature of alkaline soils in California and revealing their importance to agricultural production, along with his detailed studies of the impacts of the fungal pathogen phylloxera on grapevines, convinced both the scholarly and agricultural communities of the value of the College of Agriculture (see Entomology and Pest Management, and Soil Science).

Hilgard brought the true inquisitiveness of science to his mission as dean. He recognized California as a unique and diverse environment, and set about performing fieldwork to determine the specific needs for agriculture in the state, rather than assuming that information and practices valid in Europe, or in the eastern U.S., would work here.

Through his fieldwork, Hilgard established the first agricultural experiment station in the U.S. and set the framework for the Division of Agricultural Sciences, now the University of California systemwide Division of Agriculture and Natural Resources. He took advantage of the funds provided by the 1887 Hatch Act to establish research stations in the Sierras, the Coast Range, the San Joaquin Valley, and Southern California to allow research across a wide variety of environmental conditions. By 1900, Hilgard’s experiment station concept had become a resounding success and he had established a solid partnership with California agriculture.

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Right: CNR researchers have made key discoveries about plant biology and genetics. Here a gene is being injected directly into a cell.



Hilgard also began in-the-field meetings called Farmer's Institutes to bring new findings and new ideas directly to the farmers. This idea continues today as the University of California Cooperative Extension.

Farming, Forestry, and Agricultural Economics

Although farmers accepted the benefits of bringing science to agriculture, they wanted a university to offer practical training under actual farming conditions—not possible on a large scale at the urban Berkeley campus. In 1909, the University Farm was established in Davisville (later renamed Davis) as a field station for Berkeley agricultural research.

Forestry held a place in research and education dating back to Hilgard's arrival on campus. In 1914, a formal Division of Forestry was established within the College of Agriculture. The forestry program has evolved during the last 90 years, and still represents one of the most important areas of research and education within CNR (see Forestry and Rangeland Science).

In 1913, the Division of Rural Institutions was established, becoming the Division of Agricultural Economics by 1926. A generous donation of \$1.5 million dollars by Amadeo Peter Giannini, founder of the Bank of America, funded the creation of the Giannini Foundation and the building of Giannini Hall (see Agricultural Economics).

By 1946, several University of California campuses had been established and a systemwide reorganization of agricultural programs ensued. The Division of Agricultural Sciences was created to oversee related programs at Berkeley, Davis, Los Angeles, and Riverside. As part of this restructuring, the forestry

program was separated from the College of Agriculture to become a professional school. In 1959, the Regents declared that Davis was to be a general campus of the University. Several programs originally located at Berkeley took up permanent residence at Davis.

Today, the Division of Agricultural and Natural Resources still provides overarching programmatic support for the three remaining land-grant programs at Berkeley, Davis, and Riverside, including the Agricultural Experiment Station researchers, campus-based Cooperative Extension specialists, and county-based Cooperative Extension advisors. Chancellors and deans on each campus retain authority over faculty hiring and evaluation, and over academic programs.

The Birth of CNR

In the late 1960s and early 1970s, societal views of agriculture, forestry, and the environment began to change. Agricultural production and environmental quality were examined with a new understanding of the impact of human actions on the natural world. Agriculture's political position in the University changed as well: the Chair of the State Board of Agriculture lost his position as an ex-officio member of the Board of Regents.

Earlier that era, in 1961, the College of Agricultural Sciences developed a new academic plan emphasizing the basic sciences and strengthening graduate programs in entomology, genetics, molecular biology, and nutrition. Meanwhile, the School of Forestry expanded to include broader environmental and social research and in 1968 was renamed the School of Forestry and Conservation.



Courtesy of the Bancroft Library

Above: Walter Mulford, first head of the Cal forestry curriculum.

Top: Studies of chemical toxicity in tissues have led to the development of safer pesticides.



Jane Scheer

Former UC Berkeley Chancellor Chang Lin-Tien with former College of Natural Resources Dean Wilford Gardner.

The College of Agricultural Sciences and School of Forestry and Conservation were separate, but they shared programmatic strengths and a great degree of faculty and student interaction. The College offered lower-division courses in soils, genetics, entomology, pathology, and resource economics, which supported upper division programs in both academic units. Both units contained internationally recognized graduate programs. They even shared a very popular joint major, Conservation of Natural Resources, a program that was initially proposed by Richard Douthett, acting dean of the College of Agriculture, and developed by a group of faculty from both units.

Yet several factors were pointing towards a need to consider organizational change. While interest in forest and resource management and enrollment at the School of Forestry and Conservation were high, the College's undergraduate enrollments were declining. Students planning to pursue a career in production agriculture typically attended Davis rather than Berkeley, and there was strong internal and legislative pressure to reduce duplication of programs across campuses.

Beginning in 1968, several committees and a task force were formed to discuss

merging the College of Agricultural Sciences and the School of Forestry and Conservation. Effective July 1, 1974, undergraduate programs of both were combined into a single College of Natural Resources.

The mission of the new college was stated by then Berkeley Chancellor Albert H.

Bowker: "The central concern of the college will be with the renewable resources of all non-urban lands of the state—forests, grasslands, farms, brushfields, and barren lands. Its efforts will provide the scientific knowledge, professional skills, and awareness of public purposes needed for the use and management of these resources."

CNR History: A Brief Chronology

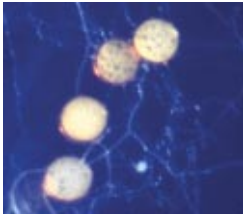
- 1862** Morrill Land Grant College Act passed, authorizing land grants to states that established colleges of agriculture and mining arts.
- 1868** Organic Act established the University of California.
- 1875** Eugene Hilgard assumed leadership of the newly formed College of Agriculture.
- 1912** Agricultural Hall completed (renamed Wellman in 1968).
- 1914** Division of Forestry established in the College of Agriculture; at that time, College had 17 teaching units, including the Agricultural Experiment Station and Extension Service.
- 1917** Hilgard Hall dedicated.
- 1925** Purnell Act allocated funds for study of Agricultural Economics and Rural Sociology at land-grant universities.
- 1928** Amadeo Peter Giannini donated \$1.5 million to establish Giannini Foundation and build Giannini Hall.
- 1930** Giannini Hall completed, Giannini library established.
- 1939** Division of Forestry became Department of Forestry; College of Agriculture reorganized into four departments: forestry, agriculture, home economics, veterinary medicine.
- 1946** School of Forestry established as separate professional school.
- 1946** University systemwide reorganization of agricultural programs: Division of Agricultural sciences established encompassing related programs at Berkeley, Davis, Los Angeles, and Riverside.
- 1961** Universitywide Academic Plan called for diversification of agricultural colleges on three campuses; Berkeley became College of Agricultural Sciences.
- 1974** College of Natural Resources created from merger of College of Agricultural Sciences and School of Forestry and Conservation.
- 1992** College of Natural Resources reorganized into four departments: Agriculture and Resource Economics; Environmental Science, Policy, and Management; Nutritional Sciences and Toxicology; and Plant Biology.
- 1996** Division of Microbial Biology established as part of Department of Plant and Microbial Biology.
- 1998** Environmental Sciences established as first joint undergraduate major with College of Letters and Science.

CELEBRATING OUR PAST AND OUR FUTURE:
The College of Natural Resources
Reaches 30 Years

Courtesy of Steven Eieisinger



Courtesy of Teresa Pawlowicka



College research has wide-ranging impacts in such fields as wildlife conservation, microbiology, forestry, and plant biology.

College of Agricultural Sciences Dean Loy Sammet said at the time “After more than 100 years of successful academic involvement in the growth of California agriculture, we view the reorientation signaled by this merger as a healthy adaptation of the College’s capabilities to changing social needs in resource use.”

Implementation of the new plan took several years. Conservation and Resource Studies, which had been operated as a program out of the Office of the Dean, was expanded into a department. The forestry program initially consisted of two departments: Forestry and Conservation, which operated the research side of the program, and Forestry and Resource Management, which contained the teaching program. In 1978, Department Chair Dennis Teeguarden consolidated the departments into Forestry and Resource Management.

Separate departments remained for Agricultural Economics, Cell Physiology, Entomological Sciences, Plant Pathology, Nutrition and Dietetics (see Nutrition and Toxicology), Genetics, and Soils and Plant Nutrition.

Moving Toward the New Millennium

A campuswide reorganization of biology led to additional changes in the College (see Plant and Microbial Biology) and by the 1990s, the time had come once again to evaluate the College’s structure and programs. The reorganization aimed to coordinate and strengthen the College’s interdisciplinary approaches to critical environmental problems and add new majors focusing on environmental biology and resource management.

In 1992, the Department of Environmental Science, Policy, and Management (ESPM) was created, consolidating several of the departments—Conservation and Resource Studies, Soils, Forest and Resource Management, Entomology, and Plant Pathology—into one unit that remains today. ESPM now has three divisions: Ecosystem Sciences, Society

and Environment (see page 13), and Insect Biology. CNR’s other current departments include Agricultural and Resource Economics, Plant and Microbial Biology, and Nutritional Sciences and Toxicology.

The latest reorganization also established research centers and facilities where the College’s Cooperative Extension specialists and faculty researchers can work together to fulfill the land-grant mission of the College, and bring science-based insight to real-world issues such as wildland fire, childhood obesity, agricultural sustainability, water rights, and biotechnology.

The effect of the reorganizations has been real but subtle. New faculty were recruited and new curricula developed to address the changes in students’ interests over time. Research areas were broadened to reflect scientific advances in the faculty’s fields of expertise. But the College’s mission to research, educate, and extend knowledge to improve the lives of Californians has remained constant.

Where Are We Today?

While CNR faculty and Cooperative Extension specialists maintain the disciplinary excellence that is the hallmark of UC Berkeley, scientific and environmental issues more and more often cross disciplinary lines. Today, faculty members participate in broad-based initiatives that recognize the complexity of the issues facing society.

For example, experts in atmospheric science, forest biology, rangeland ecology, and agricultural economics are working together to address the multifaceted issues surrounding global climate change. Entomologists and plant biologists are working with colleagues in public health to identify and stay ahead of devastating emerging diseases. Societal issues are addressed broadly, including biotechnology, environmental ethics, intellectual property rights, and land

development along the urban-wildland interface.

Student enrollment at the College has waxed and waned over the years. One of the greatest challenges for Ezra Carr, the first head of the College, was attracting students. Interest in forestry and resource management peaked in the 1930s and 1970s, reflecting national trends. Yet enrollment in the School of Forestry hit a low in the mid-1940s, dropping from 93 graduates in 1939 to four graduates in 1945, due to both student and faculty military service. Today, as the College designs programs to meet the interdisciplinary interests of its present and future students—such as the joint program with the College of Letters and Science in Environmental Sciences—enrollment is on the upswing again.

Our buildings also represent both a rich history and a challenge. The buildings that house CNR reflect the great researchers and supporters who developed the College. The Agriculture Group—Wellman (1912), Hilgard (1917), and Giannini halls (1930)—was designed by the famed architect John Galen Howard, who designed much of the original campus. The group is listed on the National Register of Historic Places and is a designated landmark of the campus, the City of Berkeley, and the State of California. Mulford Hall (1948), Morgan Hall (1953),

which holds the famous “penthouse” used for the first live-in nutrition studies, and Koshland Hall (1990) house the other College programs.

While the grandeur of these buildings reflects an illustrious history, all but Koshland are insufficient for the research needs of today’s scientists. From seismic concerns to outdated laboratories, one of the College’s greatest challenges is to bring its facilities up to the par of its faculty and students.

Throughout its history, the College has been home not only to outstanding scientists, but to remarkable people in all aspects of their lives. The faculty’s keen interest in students has built a reputation that the College still enjoys as having close student-faculty interaction.

“That high caliber continues today in our faculty, specialists, staff, and students, and allows CNR to fulfill its mission of training the leaders of the future,” said current Dean Paul Ludden.

While names and even programs may change, this theme—excellence in research, instruction, and outreach among a community of dedicated individuals—carries the College forth into a future of exploration on the frontiers of science. 🇺🇸

For more information on the history of the College of Agriculture, the School of Forestry, and the College of Natural Resources, you may want to consult the following resources, which provided many of the historical details for this article.

Casamajor, Paul, ed. *Forestry Education at the University of California: The First 50 Years*. Berkeley: California Alumni Foresters, 1965.

Helfand, Harvey. *University of California, Berkeley, Campus Guide: An Architectural Tour and Photographs*. Princeton Architectural Press, 2002.

Scheuring, Ann Foley with Chester O. McCorkle and James Lyons. *Science & Service. A History of the Land-Grant University and Agriculture in California*. The Regents of the University of California, Division of Agriculture and Natural Resources, 1995.

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University of California History Digital Archives, <http://sunsite.berkeley.edu/uchistory/> and <http://dynaweb.oac.cdlib.org:8088/dynaweb/uchist/public/inmemoriam>.



Current CNR Dean Paul Ludden discusses a laboratory experiment with a student.



The lawn near Giannini Hall offers a comfortable place to study.



CNR offers many classes with a low student-teacher ratio.



Highlights of Excellence

Forestry professors Metcalf, Tissot, Fritz, Bruce, and Gerhardy on a trip to Inverness in 1920.



FOR MORE THAN 130 YEARS, RESEARCHERS AT THE COLLEGE have made major contributions to science and society. The accomplishments of the College are too numerous for us to comprehensively address in this special issue. The following sections highlight just a few areas in which the College has both a strong history and exciting future: forestry, rangeland science, agricultural economics, social science, entomology and pest management, nutrition and toxicology, plant and microbial biology, and soil science. Throughout the College's history, common values persist: adaptation to social change, development and adoption of new technology, and advancement of an interdisciplinary world view.

An Integrated Approach to Forestry

Although a forestry program was first proposed at Berkeley in 1886 and again in 1899, it did not get off the ground easily. The University of Southern California opened a forestry school in 1889 but it closed within one year. Proposals failed to pass the state assembly in both 1903 and 1905. But researchers with the College of Agriculture were still active in forestry.

It took enthusiastic student interest and advocacy, as well as faculty support, to establish a formal home for the study of both the basic aspects of forest biology and the practical aspects of timber harvesting. The student forestry club began in 1911 and in 1914, the College of Agriculture launched a Division of Forestry.

The first head of the forestry program, Walter Mulford, set forth a lasting vision for forestry, just as Hilgard had done for the College. He developed a strong undergraduate program based for the first two years on general academic enrichment, followed by specialization in either forest management or logging engineering in the upper division courses. He established forestry summer camp, an intensive field course that continues to this day as one of the strongest community-building educational experiences on the Berkeley campus. And he founded an outstanding forestry library by donating his own collection of books.

In 1922, the forestry program also launched a program in grassland ecology and management, housed today in the Division of Ecosystem Sciences (see Rangeland Science).

In 1926, Woody Metcalf was appointed as the first Cooperative Extension forester. He played a key role in developing better rural fire protection throughout the state. In 1934, Frederick Baker, a professor of silviculture at Berkeley, produced *Theory and Practice of Silviculture*, the first American textbook in its field.

Other major forestry research took place during these years. Joseph Kittredge Jr., who came to Berkeley in 1932 as professor of forestry and an ecologist in the Agricultural Experiment Station, pioneered studies on the effect of forest vegetation on water storage and snow melt. Harold Biswell, who joined the faculty in 1947, conducted the first experiments using prescribed burning to reduce the risk and severity of wildfire in California.

"Biswell was the first to challenge the orthodoxy by asking if we were doing the right thing by eliminating all fire. That was a really radical idea at the time," said Professor Emeritus Dennis Teeguarden, former chair of the Department of Forestry and Resource Management.

The field of forest photogrammetry also owes much to Berkeley research. Bob Colwell, a Berkeley plant physiology graduate, joined the faculty in 1947. He was one of the first experts in the young field and was a catalyst for the development of remote-sensing techniques. He went on to play an instrumental role in the launch of LANDSAT 1, which revolutionized the fields of cartography, forestry, geology, and land use.

Just before Mulford's 1946 retirement, the division was separated from the College of Agriculture into a professional school as part of the establishment of the UC systemwide Division of Agricultural Sciences. As a professional school, the School of Forestry could offer only upper division and graduate programs. The lower division pre-forestry program remained with the College of Agriculture.

Henry J. Vaux became dean of the School of Forestry in 1955. By 1964, the School was rated among the top three or four programs in the U.S. A balanced approach between teaching and research and more visibility for the Agricultural Experiment Station marked his tenure. But Vaux's

Right: Ed Stone

Far right: Henry J. Vaux



greatest influence came later. He served as chairman of the State Board of Forestry from 1976 to 1983 and guided major revisions of the forest practice rules, which were based, in part, on research at Berkeley.

Professor John A. Zivnuska followed Vaux as the fourth dean of the School of Forestry (1965-1974). Zivnuska and Vaux were pioneers in establishing the field of forest economics as a subdiscipline of land and resource economics. Zivnuska was internationally known for his works in forest resource evaluation, industrial economics, forest taxation, long-term demand and supply analysis, and international forestry.

In 1967, the necessity of incorporating other academic disciplines into the study of forestry led to the transfer of the campus wildlife and fisheries program to the School of Forestry, led by Professor Starker Leopold. Through his public service on several advisory boards for the Department of Interior, Leopold set the framework for resource management policy in the National Park Service, and the national wildlife refuge system.

In addition to his scientific and policy accomplishments, Leopold was known as one who could bridge gaps between diverse groups with opposing viewpoints over natural resource use. Leopold and his students made wildlife a strong and ongoing part of the research and curriculum. In 1968, the School's name was changed to reflect this expansion, to the School of Forestry and Conservation.

"When I came to Berkeley, forestry was almost exclusively occupied with the timber resources, as it was in most forestry schools around the country," said Teeguarden. "Legislation such as the Endangered Species Act and National Forest Management Act sent a clear message from society that forests are valuable on a broader basis than trees alone." Integrated management for a whole bundle of values became the goal.

By the 1970s, the Berkeley program ranked as the nation's number-one forestry school. Nearly all of the top positions in public forestry were held by alumni, as were leadership positions in industry and academia.

Berkeley's forestry program also made great strides in attracting females to a male-dominated field. It is believed that the first B.S. in forestry awarded to a woman was to Alice Craig from Berkeley ('28). But still, by 1965, only nine women had graduated from the Berkeley program and only three had attended summer camp. However, growing interest in the environment in the 1970s led to more women considering forestry as a potential career. Last year, 60 percent of the forestry program graduates were female.

In 1984, Louise Fortmann, a rural sociologist, was recruited as the first female faculty in forestry at Berkeley. "A lot of the 'first women' appointed to academic units are unwelcome and their lives are made miserable. Here they tried to do everything they could to help me," said Fortmann. Professor Fortmann now chairs the Division of Society and Environment (see page 13).

Crucial to the forestry program's research and teaching have been forested properties acquired in the early 1900s. In 1933, Mulford recommended that the Regents accept a donation of 2,680 acres of mixed conifer land in El Dorado County. Named Blodgett Forest in honor of the principal owner of Michigan-California Lumber Company, who donated the land, the site has for many years been one of the primary research and demonstration forests on the Pacific Coast. Purchases and additional donations have increased Blodgett Forest Research Station to its current 4,400 acres. Today College faculty use the station for more than 80 research projects on fire, global climate change, silviculture, wildlife, and other aspects of forestry and forest ecology. Other College forestry properties include Howard Forest in Mendocino County, Whitaker Forest in Tulare County, Baker Forest (including summer camp) in the Plumas National Forest, and the Russell Reservation in Contra Costa County.



John Zivnuska in Cascade Head Experimental Forest, 1952.

Courtesy of the Biosciences Library



Female forestry students, like Tina Lyons-Tinsley (left) and Galen Peracca, now outnumber males in the Berkeley program.

Kevin O'Hara

Highlights of Excellence



Berkeley researchers conducted some of the first work on prescribed burning as a management tool.

In 1974, the forestry program began a significant series of organizational changes. Under the leadership of John Zivnaska and E. Gorton Linsley, the School of Forestry and Conservation merged with the College of Agricultural Sciences to form the College of Natural Resources. In 1992, the Department of Forestry became a division of the Department of Environmental Science, Policy, and Management. And in 2003, the forestry faculty took up residence throughout the College rather than within one department or division.

"Forestry has become so diverse that it can no longer be contained in one department," said Rick Standiford, Associate Dean for Forestry and Capital Projects. Standiford lists Associate Professor Allen Goldstein—a biogeochemist in the College studying human-induced atmospheric changes—as a prime example of this interdisciplinary nature. "Someone like Allen would never have been considered a forestry researcher 15 years ago. Now he's running one of the key projects at Blodgett Forest."

At a summit with industry, academics, and land managers held last fall to discuss the future of the forestry program, Mark Rey, undersecretary of USDA Forest Service, said that 90 percent of the senior managers in the Forest Service and Natural Resources Conservation Service will be

eligible to retire within the next five years. The College is well-positioned to provide the next generation of natural resource leaders.

As the population of California grows and the separation between urban and rural areas decreases, the forestry program at Berkeley is more important than ever. The College's forestry and fire experts routinely testify at Congressional hearings on issues such as wildfire management and protection of important natural areas such as the Lake Tahoe Basin. Max Moritz just joined the program as the nation's first Cooperative Extension specialist in fire management (see the Faculty section of this issue for more on Moritz).

And new technologies are allowing scientists to look at forest issues from myriad angles.

Says Standiford: "Today we can look at the forest from molecular to global levels—through a microscope, or from space. This allows us to understand forests in ways that were never before possible."

The Faculty of Forestry comprises more than 50 scientists and Extension academics throughout the College, in other areas of the Berkeley campus, and in the UC Division of Agriculture and Natural Resources.



Kevin O'Hara

Students at forestry summer camp experience field applications of their classroom education.



Courtesy of the Biosciences Library

Above: Students in an early forestry laboratory in Hilgard Hall.

Above left: Assistant Professor Scott Stephens at Blodgett Forest discussing a long-term study assessing the effects of fire and fire surrogates such as cutting—or lack thereof—on the forest ecology.

Above right: Blodgett Forest Research Station.



Arthur Sampson

Interdisciplinary, Ecology-Based Rangeland Science

Arthur Sampson was an established plant ecologist when he joined the College of Agriculture in 1922. As a professor in the Division of Forestry, he launched the field of rangeland science with three important books between 1923 and 1928: *Range and Pasture Management*; *Native American Forage Plants*; and *Livestock Husbandry on Range and Pasture*.

Sampson was especially interested in the ecology of western ranges and began research that addressed issues still of importance today, such as managing undesirable plant species and the role of fire on rangeland ecology. He was one of the first researchers to study grazing and watershed problems in the West, and the first to teach a continuing course in range management.

With the support of Forestry Chair Walter Mulford, Sampson advocated an interdisciplinary education for range scientists, supplementing range training with the physical, biological, and economic sciences. Ever since Sampson's time, the rangeland science program at Berkeley has set itself apart as ecologically based and interdisciplinary.

Rangeland science continued to gain in stature as the California Forest and Range Experiment Station was located on the Berkeley campus in 1925. In 1933, a Range Committee was established, at first to investigate the long-term effects of brush burning. Their results, which found no deleterious effects from systematic brush removal, eventually convinced the legislature to remove some prohibitions against brushland burning.

Professor Emeritus Harold Heady, another key figure in the history of rangeland science, joined the College faculty in 1951. Heady was the first to explain the dynamics of annual grasslands, with application to Mediterranean grasslands worldwide. He was awarded the Society for Range Management's top honor in 1980 for sustained outstanding accomplishment in range management or science and received the Berkeley Citation in 1991.

Subsequent generations of students continued to make key discoveries about grasslands. Professor Jim Bartolome was the first to disprove a long-held theory that purple needle grass dominated native perennial grasslands. He also discovered that annual grasslands can be managed productively for biodiversity using residual dry matter, a technique now used routinely.

Others in the College challenged and refined models of ecosystem change in Mediterranean woodlands, analyzed grazing impacts on water quality, and documented landowner goals in the management of private rangelands.

Professor Barbara Allen-Diaz, originally a student in Bartolome's laboratory and now Executive Associate Dean of the College, illustrated that livestock could be used as a vegetation management tool in forests, as a chemical alternative. Livestock are now routinely used to remove unwanted or invasive vegetation.

In 1986, the program was augmented by a new UC systemwide range program, the Integrated Hardwood Range Management Program. The IHRMP joins researchers across UC campuses to ensure sustainability of the state's 10 million acres of hardwood rangelands.

Although CNR's range program has always maintained an ecological focus, computers led to changes in the way research was conducted. "The cutting edge of range ecology has become more quantitative, with better theoretical models and an ability to handle complex data sets," said Bartolome. "There has also been a shift in the specific problems we work on. While previously we focused on livestock grazing, today we address more social issues."

Associate Professor Lynn Huntsinger took an early lead on social issues with research into rangeland landowner practices, goals, and values in California. This work helped launch the dramatic nationwide shift over the last 10 years in attention to private-lands conservation and landscape-level conservation programs, as well as the inclusion of human-values research and programs into rangeland management.

Allen-Diaz predicts that rangeland science of the future will still revolve around indicators for sustainability, involving the social and environmental effects of grazing animals. "Livestock animals graze on more than half of the Earth's lands. Distribution and composition of grasslands and shrublands are key to a wide variety of issues, ranging from carbon storage and global climate conditions, to local economics and social structure of pastoral and nomadic societies."

The program's interdisciplinary tradition will also continue. Said Bartolome, "The current organization of environmental science allows for a high level of collaboration by Berkeley range faculty with other environmental scientists. We have an 80-year history of questioning traditional ideas in management and ecology."

The Rangeland Science program is housed in the Ecosystem Sciences division of the Department of Environmental Science, Policy, and Management.



Range management has been an important research area at the College since 1922.

Highlights of Excellence

Amadeo Peter Giannini



Agricultural Economics: Cost, Value, and Sustainability

The 1920s provided a prime stage for the emergence of a world-class academic focus on agricultural economics at the College of Agriculture. The post-war economy led farmers nationwide to recognize the need to understand the economic side of agriculture. The 1925 Purnell Act allocated federal funds for the study of agricultural economics and rural sociology at the land-grant universities. And the Berkeley campus gained a significant benefactor in Amadeo Peter Giannini, founder of the Bank of America.

Economist Henry Erdman joined the Division of Rural Institutions in 1922. He studied the operation of various kinds of cooperative organizations in the state. Within a couple of years, he produced the first in what was to become a long history of seminal contributions for agricultural economics in the College: a model constitution for organizing a cooperative. Companies like Sunkist and Sun Diamond originally formed using this model.

By 1926, the unit had been renamed twice, finally becoming the Division of Agricultural Economics. Harry Wellman joined the College as the first economics specialist in the Cooperative Extension Service. He and another College economist, E.C. Voorhies, produced the first series of crop and price outlook studies of crops and the poultry industry over the next three years.

During this same period, Amadeo Giannini, the son of immigrant vegetable growers in the Santa Clara Valley, had established a very successful, farmer-friendly bank. The Bank of Italy, later known as the Bank of America, was the first to pioneer branch banking and to expand into rural California. To honor Giannini on his 60th birthday, the bank's directors offered him a bonus of \$1.5 million. In 1928 he donated the entire sum to the University. One-third of the money was earmarked for building Giannini Hall, and the rest to establish the Giannini Foundation of Agricultural Economics to support research bearing on the economic status of California agriculturalists. Giannini Hall was completed in 1930.

Today, the foundation continues to serve researchers at the three land-grant campuses, and its library boasts the world's finest collection of publications and data related to agricultural economics.

The College's economists have long contributed to national and international economic planning, and many of the current faculty continue to provide research support and analysis of state and federal legislation. Early on, faculty participated in the New Deal and several took leaves of absence from campus to serve in temporary federal positions. In the 1960s, Professor Emeritus Irma Adelman was a senior advisor to the government of South Korea and designed that country's second five-year

plan, which launched it on a strategy of export-led growth. The concepts for designing reforms of agricultural and food policies developed at the Uruguay Round of the General Agreement on Tariffs and Trade (GATT) originated here.

The arrival of computers at the University in the 1960s transformed the field of agricultural economics from a descriptive to a quantitative science. Working with a refrigerator-sized, vacuum tube, magnetic drum computer, teaching assistant James Boles helped researchers link economic modes with machine computations. Boles later worked as both professor and chair of the department.

Other key concepts in agricultural and resource economics that originated with the College's agricultural economists or that were developed based on work done here include:

- Econometrics, or using statistical and mathematical methods to define numerical relationships between key economic forces
- Contingent valuation, a measurement vehicle for determining the value to society of natural resources
- Option value, an analytical concept that incorporates relevant uncertainties in the measurement of the gains and losses from environmental and resource projects, used to analyze sustainable natural resources, especially biodiversity
- Economies of Scope, an economic theory stating that the average total cost of production decreases as a result of increasing the number of different goods produced.

In 1978, the growing importance of natural and environmental resources both in policy debates and in academic economic research led the department to change its name to Agriculture and Resource Economics (ARE).

Faculty in the department also direct and participate in the College's Center for Sustainable Resource Development. The center facilitates the global interaction of natural resource professionals and researchers who work on common problems.

Gordon Rausser, former Dean of the College and two-time former chair of the department, sees agricultural economists as playing a key role in achieving natural resource sustainability. "How do we design effective institutions and governance that balance economic growth and environmental quality?"

As the nation's top-rated program in agricultural economics, faculty and alumni from ARE are sure to help answer this question.

Class of graduate students in agricultural economics, 1936.



Society and Environment: Starting Rural, Going Global

As society's approach to resource and environmental issues has changed and understanding of the natural world has grown more complex, UC Berkeley has innovated and led the development of social sciences in the natural resources field.

The College of Agriculture's first real advocate of social sciences was a civil engineer and irrigation expert. In an assessment prepared in 1911, Dean Thomas Hunt noted that the College needed to develop strong courses in rural economics and sociology. In 1913, he hired Elwood Mead to head the new Division of Rural Institutions.

Mead was internationally known as a manager of irrigation projects, but he had a strong social vision. His experiences using irrigation plans to help with colonization efforts in Australia led him to believe that state-sponsored land settlement colonies could increase the economic and social value of small farms in California, and he convinced influential state leaders of this principle. So, while he developed academic coursework, his most notable contribution was the unprecedented integration of the University of California's land development projects. Just as the land settlement program reached fruition, the United States joined World War I. A short agricultural boom was followed by a steep crash after the war ended.

Mead effectively left the College in 1923 and Dean Hunt stepped down that same year. The Division of Rural Institutions was renamed the Division of Agricultural Economics in 1924 (see Agricultural Economics).

For the next decade, the College largely avoided non-economic work on labor and social issues of agriculture, with one exception. Dean Claude Hutchinson served on a governor's select committee to investigate strike-breaking activity among farm labor in the Imperial Valley. The committee concluded that worker agitation had been fostered by Communists and Hutchinson's zeal in this regard brought criticism and led the University and the Experiment Station to keep a low profile on labor matters for many years.

That changed in 1937 when Carl Alsberg, director of the Giannini Foundation, hired Dorothy Swane Thomas to join the faculty as a professor of rural sociology. In 1942, Thomas researched wartime relocation of California's Japanese population to internment camps.

After WW II, social science at the College was largely restricted to economics. Within the School of Forestry, a new subfield, forestry economics was launched (see Forestry). As the forestry program broadened, Berkeley was the first to include a full-fledged social science program as a central element of its forestry program, including researchers in rural sociology, forest policy, and environmental history.

Social science was formalized as its own division—Resource Institutions, Policy, and Management (RIPM)—when the Department of Environmental Science, Policy, and Management was created in 1992. In 2002, the name was changed to Society and Environment in order to better reflect the nature of the research in the division. The division continues to grow, with a programmatic emphasis on equitable access to resources and environmental justice. Faculty are also strongly involved in the globalization of resource issues and the division has just hired the first bioethicist on the Berkeley campus.

Society and Environment is in the Department of Environmental Science, Policy, and Management.



Peq Skorpinski



Courtesy of Dara O'Rourke



Courtesy of Arielle Levine

Researchers in Society and Environment bring social science perspectives and tools to the teaching and analysis of natural resource issues worldwide.



Courtesy of Dara O'Rourke

Highlights of Excellence



Above: E.O. Essig

Top: Professor Wayne Getz illustrates the distribution of West Nile virus in the United States.

Center: Professors Herms, Van Dyke, Linsley, Aiken, and Michelbacher on a trip to Idyllwild in 1939.



Courtesy of Dave Wood

From Forests to Fields: Entomology and Pest Management

One of Eugene Hilgard's first scientific studies upon his arrival at Berkeley was to examine grapevines suffering from infestation by a root louse, phylloxera. Although he was trained in chemistry and geology, Hilgard's application of the scientific method to help growers combat phylloxera established entomology and pest management as core areas of research since the College's inception.

Charles Woodworth joined the faculty in 1891 as the first entomologist with teaching responsibilities in California. He gave the first elementary entomology course in 1882. For 29 years Woodworth headed what eventually became the Division of Entomology. In 1920, parasitologist William Herms succeeded Woodworth and the division was renamed Entomology and Parasitology.

Edward Oliver Essig, perhaps the world's foremost entomologist at the time, joined the College in 1914. He offered the first course in insect pathology given in any university, and also developed a course in nematology. As part of the Agricultural Experiment Station, Essig, along with Earle Gorton Linsley, also developed the California Insect Survey. The survey grew out of the realization among entomologists that the most basic aspects of insect biology were poorly understood and expertise was not sufficient to address practical problems.

The survey set out, and continues today, to develop and maintain research collections of all significant groups of terrestrial arthropods in California. Formalized as part of the Agricultural Experiment Station in 1939, the survey began with about 15,000 specimens and today numbers more than 5 million. The collections are housed on the Berkeley campus in the Essig Museum of Entomology, which also holds collections from a long history of noted Berkeley entomologists.

"The outstanding work done on insect systematics formed the basis for work that continues today," said David Wood, professor emeritus and former chair of insect biology, and professor of the graduate school.

In 1932, the College added chemist Roderick Craig to the faculty. He developed a pioneering program in insect physiology and was among the first investigators to use radioisotopes in biological research.

At the same time the Berkeley entomology program was gaining notoriety, the Division of Beneficial Insect Investigations was established at the Citrus Experiment Station in Riverside. In 1923, a separate unit for biological control research was set up within the division. In 1944, the unit became the Division of Biological Control and moved to a small piece of property near the Berkeley campus known as the Gill Tract.

Carl Huffaker, a leading population ecologist, was one of the first people to run the Gill Tract facility. In 1946, as one of his first tasks, he joined with USDA's James Holloway to attempt to control invasive Klamath weed using classical biological control. The technique, which involves discovering and importing natural enemies from the country of origin of a pest, had been spectacularly successful in the late 1800s when the USDA imported vedalia beetles to control cotton cushiony scale on California citrus.

Top left: Cooperative Extension Specialist Vernard Lewis demonstrates non-chemical termite control methods.

Top right: Ray Smith received the 1997 World Food Prize for his work on integrated pest management.



Noah Berger



Noah Berger

When they started the research, Klamath weed threatened grazing on 2.25 million acres of western land. Their efforts, which involved collection of Australian beetles that were natural enemies, resulted in total and permanent control of the weed. This was just the beginning of Huffaker's important contributions to the field of biological control.

Huffaker conducted experiments to elucidate the fundamental nature of predator-prey interactions. He served as world coordinator for the biological control of spider mites. At the request of the National Science Foundation, he conducted a feasibility study for a long-term, nationwide, integrated pest control research program. The program, eventually funded by the National Science Foundation and the Environmental Protection Agency, involved 19 land-grant universities and segments of the USDA. The program, later known as the "Huffaker Project," served as the prototype for integrated pest management programs (IPM) worldwide.

Ray Smith, a Berkeley alumnus who ultimately served as co-leader of the Huffaker Project, joined the Division of Entomology and Parasitology as an assistant professor in 1946. He developed the technique called "supervised control," the routine monitoring of pest populations and their natural enemies in the field and prescribing what, if any, control is needed. In 1959, Vernon Stern of UC Riverside and Berkeley's Smith, Robert van den Bosch, and Kenneth Hagan published the seminal paper "The Integrated Control Concept," in the journal *Hilgardia*, introducing integrated pest management as it is known today. Smith, who was particularly active in demonstrating and publicizing IPM techniques, received the 1997 World Food Prize for his efforts, along with Perry Adkisson of Texas A&M University.

In 1952, the division expanded into a department. Smith became chair in 1959, and led a restructuring that resulted in the Department of Entomological Sciences. The new department had an academic instructional unit—the Department of Entomology and Parasitology—and four autonomous research divisions: Biological Control, Entomology and Acarology, Invertebrate Pathology, and Parasitology and Medical Entomology. This broad-based program gained stature as the best entomology program in the country.

Robert van den Bosch, who had been a student of Smith's before joining the department faculty in 1962, spent much of his career devoted to the advancement of biologically based pest control methods. Just before his death in 1978, he completed *The Pesticide Conspiracy*, which describes the influence of big business on the development and use of pesticides.

Pest management is still a crucial focus of the College's entomologists. Donald Dahlsten, who passed away in 2003, is credited with saving the state's eucalyptus foliage industry in 1991-93 by discovering natural enemies to control psyllid pests, which attack certain varieties of eucalyptus trees. Today, entomologists in the Division of Insect Biology work on the cutting edge of emerging pest problems, including control of codling moths in western orchards and Pierce's disease in grapevines.

"Entomology has a lot to offer to the study of emerging diseases," said College entomologist Nick Mills. And with the development of molecular tools beginning in the 1970s, Professor Mills says the field has become more important than ever.

"Insects have become very valuable model systems with which to look at more general and more basic aspects of biology, from genetics to physiology to neurobiology. Insects are ideal because they are small, relatively easy to handle in captivity, and have a short generation time, facilitating studies of natural selection."

Biodiversity and conservation issues will also continue to be important topics for the group.

"Insects represent two-thirds of all known organisms, and we may have only described ten percent of all the insect species on Earth. If you want to think about conservation of wild environments, and conserving the functionality of an ecosystem, that's likely going to involve insects," said Mills.

The Division of Insect Biology is in the Department of Environmental Science, Policy, and Management.



Courtesy of Essig Museum of Entomology

Highlights of Excellence



Agnes Fay Morgan in the Laboratory, 1929.



Nutrition researchers in the College study foods as sources of both nutrients and potential anti-cancer agents.



The Journey from Home Economics to Nutrition and Toxicology

Although UC Berkeley did not have an official Department of Nutritional Sciences until 1962, landmark human and animal nutrition research on campus dates back to the 1870s. Researchers that today would be in the nutrition department spanned a variety of academic units in both the College of Agriculture and the College of Letters and Science.

At many universities, the earliest nutrition research often came from animal agriculture, while academic instruction was assigned to home economics. This structure held true at Berkeley, when Myer Jaffa began to conduct nutritional studies. After completing a degree at Berkeley, Jaffa became assistant chemist of the Agricultural Experiment Station in 1879 and in 1918 was appointed as the first professor of nutrition in the nation.

Jaffa conducted the first food analyses and dietary studies of Chinese immigrants and the vegetarian community in the Bay Area. Through his work on food chemistry, he was also largely instrumental in the passage of the California Food and Drug Laws, which were formulated on the same basis as the Federal Food and Drug Act of 1906.

From 1909 to 1916, there was increasing interest in training home economics teachers in California. In 1916, University President Benjamin Ide Wheeler established a Department of Home Economics in the College of Agriculture to meet this need.

In 1915, Agnes Fay Morgan joined the College of Agriculture as an assistant professor of nutrition. The following year, nutrition and dietetics courses were moved from the College of Agriculture to the College of Letters and Science. Home Economics was split into “household art” and “household science,” the latter under the direction of Morgan.

In 1938, the Department of Household Science returned to the College of Agriculture and was renamed Home Economics. The household art offerings remained in L&S, forming the Department of Design.

Meanwhile, scientists in other L&S research units on campus were making key discoveries about nutrients. Anatomist Herbert Evans and physiologist Katherine Bishop discovered vitamin E in green leafy vegetables in 1922. Evans isolated vitamin E in 1936, as well as linolenic acid in 1934.

In the College of Agriculture, poultry scientists were making important scientific advances that benefitted both animal and human nutrition. Tom Jukes was interested in improving the health of livestock, and his postdoctoral work in the poultry husbandry unit led to the discovery that vitamin B was actually a complex of several compounds. In 1936, his collaboration with Samuel Lepkovsky demonstrated that a critical substance, later known as the vitamin pantothenic acid, prevented skin disease in chicks.

In 1938, Lepkovsky was the first to report the isolation of pure crystalline vitamin B6. During his service in WWII, he contributed greatly to the development of combat rations. After returning to Berkeley, Lepkovsky pioneered the new field examining the role of the central nervous system in appetite, digestion, and satiety—a field still under investigation.

Robert Stokstad, under Herman Almquist in the poultry science unit, conducted his postdoctoral research on a hemorrhagic chick disease caused by a nutritional deficiency, and the missing factor was later shown to be vitamin K. Stokstad then left the University for private industry.



Don Aron



Jim Edeiken

Above: Morgan Hall housed home economics courses in the past.

Left: Nutritional Sciences team, circa 1973. (standing, from left) George Briggs, Sheldon Margen, Robert Stokstad, Janet King, George Chang; (sitting, from left) Doris Calloway, Maynard Joslyn, Barbara Kennedy, Richard Lyman.

Graduate study and research in nutrition began in 1930, organized under a graduate group in animal nutrition. In 1946, Agnes Morgan became chair of the group and renamed it "Nutrition." Between 1931 and 1962, nearly 300 scientific papers, 133 master's degrees, and 35 Ph.D.s came out of this group.

In addition to her teaching and administrative responsibilities, Morgan conducted groundbreaking research on vitamin deficiencies. She was the first to detect the role of a B vitamin in adrenal function and in the pigmentation of skin and hair. Morgan also coordinated the first nationwide studies of the nutritional status of U.S. citizens.

Two years after Morgan's 1954 retirement, the unit was renamed the Department of Nutrition and Home Economics. In 1961, the Department of Food Science and Technology merged with the nutrition program, adding strengths in food chemistry and biochemistry with notable researchers like Maynard Alexander Joslyn, one of the founders of food technology science. In June 1962, the last general home economics degrees were awarded and the department name was changed again, to Nutritional Sciences.

In 1963, Robert Stokstad—famous by now for his work on folic acid—returned to Berkeley to join the faculty of the Department of Nutritional Sciences. His research group contributed key findings on the metabolism of folic acid, vitamin B-12, and methionine. They were the first to isolate many of the mammalian enzymes involved in folate metabolism. This research continued into the 1970s, when the group developed methods to allow the identification of individual folate forms in biological samples. Stokstad and his colleague Tsenonobu Tamura also performed some of the first definitive studies on food folate bioavailability in humans, using volunteer subjects living in a suite on the top of Morgan Hall that became known as "the Penthouse."

Doris Calloway also used the Penthouse to take human balance studies of protein and minerals to a new level of precision. Volunteers were confined there for up to three months while being kept on a strictly measured diet, often composed of purely synthetic ingredients. Researchers monitored aspects of nutrient metabolism down to the routine loss of skin cells. Her work, known as the Penthouse studies, became a model for careful dietary research.

In addition to carrying out her research, Calloway took on the position of campus provost—the first woman to hold the job—in 1981. In the

same period she also organized a complex intercampus investigation of the contrasting nutritional problems of young children in three developing countries.

When the College of Natural Resources was established in 1974, it included the Department of Nutritional Sciences. Researchers began to collaborate with economists and other researchers to explore nutritional problems related to worldwide food distribution, and specifically to Native American communities in the West and new immigrant groups from Asia.

In the latest CNR reorganization in 1992, the department added toxicology to its name and embraced those toxicologists previously working elsewhere in the College. The related Center for Weight and Health was also created during this time to establish multidisciplinary research and outreach efforts to combat the growing epidemic of obesity in America.

Metabolic studies continue to be the cornerstone of research at the Department of Nutritional Sciences and Toxicology, but today they use the tools of modern molecular biology. One group, for example, is studying the genes responsible for the synthesis of the enzymes involved in the deposition of fat in our tissues and their hormonal control. Another is studying genetic factors connected with folate metabolism that relate to the risk of vascular disease and neural tube defects in embryonic growth.

There is also interest in developing new ways of measuring metabolism in whole organisms, rather than just in a single tissue. "This is analogous to the work in other parts of the College studying a whole forest ecosystem rather than just one tree at a time," said Professor Emeritus Kenneth Carpenter. "Foods are not just sources of nutrients; they may contain valuable anti-cancer agents such as the indoles in plants of the cabbage family and some proteins in soy that are presently being studied."

One particular practical development of the department's work has been the modification of the treatment available for the two billion sufferers from iron-deficiency anemia in the world. It has now been confirmed that by spacing out the dosing with iron salts to weekly intervals, the side effects that had forced many patients to give up treatment can be virtually eliminated.

The challenge of the next century for metabolic researchers will be to understand how these complex metabolic networks are controlled and how to use the information being gathered about the human genome.

Highlights of Excellence



Courtesy of the USDA, Agricultural Research Service

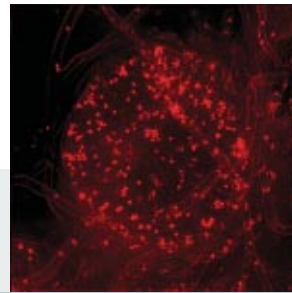


Courtesy of the USDA, Agricultural Research Service

Advances in molecular technology have allowed great advancement in developing improved crops and deciphering plant genomes.

Right: Spore of asexual fungus.

Far right: Arabidopsis with genetic information.



Courtesy of Teresa Pawlikowska



Courtesy of the USDA, Agricultural Research Service and the Salk Institute

Plant and Microbial Biology: A Century of New Frontiers

Eugene Hilgard assumed the duty of teaching botany for the campus in 1876, taking over a course originally taught by Joseph LeConte. In 1890, basic plant biology moved out of the College of Agriculture into the Department of Botany, which was established in the College of Natural Science (now the College of Letters and Science).

Early plant biology research in the College of Agriculture often had direct application to agriculture, such as development of improved crop varieties: smut-resistant wheat, better malting barley, higher-yielding Sudan grass for forage, leguminous cover crops for soil building, onions resistant to downy mildew, hardier citrus and grape rootstocks, and better strawberries, melons, tomatoes, peaches, almonds, and maize.

In the early 1900s, plant pathology emerged as a strong field in the College, and Ralph Elio Smith founded the Department of Plant Pathology in 1903. Over the ensuing 50 years, the department made significant contributions to the etiology of bacterial diseases, the physiology of rusts and mildews, and the nature of plant viruses and soil-inhabiting pathogenic fungi.

The first Division of Genetics at Berkeley—and in the country—also originated in the College of Agriculture in 1913. Under the direction of Ernest Babcock, the division's research followed the expansion of genetics as a science—plant breeding research gave way to experiments in taxonomy, leading to formal genetic studies of *Drosophila* and cytogenetic studies of tobacco and insects. For his own research, Babcock analyzed the genetic relationships and evolutionary processes in a relative of the dandelion, *Crepis*. His detailed work on the genetic relationships of the 196 species of *Crepis* led to recognition of Babcock as one of the pioneers of biosystematics.

In 1908, Dennis Hoagland joined the faculty as instructor in animal nutrition, but left soon after to serve on a federal committee concerned with the impact of food preservatives on humans. Then he completed a degree in animal biochemistry in Wisconsin, and ultimately returned to Berkeley as an agricultural chemist for the remainder of his career.

In 1922, he became the head of the newly created Division of Plant Nutrition. Under his leadership, the division became an internationally renowned center of plant research. Hoagland did pioneering work on the mineral nutrition of plants, and with Daniel Arnon provided the basic formula for a nutrient solution (Hoagland's Solution) that continues to be used worldwide for the cultivation of plants.

Arnon left the University to serve in World War II from 1943-46. While there, he applied his Berkeley research successes to a project on Ascension Island to produce food plants in nutrient culture. The techniques developed there were later used as a model for the extensive nutrient culture farms that provided food for Douglas MacArthur's army during the occupation of Japan.

After he returned to Berkeley, Arnon turned his research attention to the process of photosynthesis. In 1954, he and his research team discovered photosynthetic phosphorylation, a finding that ranks in importance with the discovery of respiration in animals. His team was also the first to obtain complete photosynthesis from chloroplasts outside the living cell (see story in College Support).

Today, much of the plant biology research in the College takes place in Koshland Hall.



In 1961, Arnon established the Department of Cell Physiology to focus on photosynthesis and nitrogen fixation. Later this department became the Division of Molecular Plant Biology within the Department of Plant Pathology.

In the 1980s, the campus gave a critical look to the organization of biology at Berkeley, which at the time cut across 20 departments in at least five colleges or professional schools. Internal and external reviews revealed that biology's structure and organization were hindering recognition of the great intellectual power at Berkeley in the field. As part of the ensuing reorganization, the Department of Plant Biology was established in 1989. Faculty from several campus units, including botany, genetics, and molecular plant biology joined the new department.

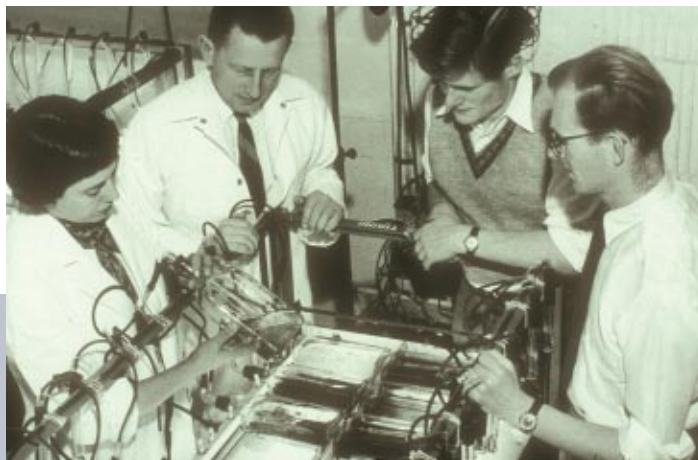
In the 1990s, deans Wilford Gardner and Gordon Rausser completed the reorganization of biology within the College to emphasize Berkeley's strengths in interdisciplinary environmental research amid discussions of removing Berkeley from the land-grant system. The remaining separate biology departments, such as Plant Pathology, Soils, and Entomology, merged with social science researchers in 1992 to become the Department of Environmental Science, Policy, and Management.

The College also established a unique collaboration with the USDA's research agency, the Agricultural Research Service. Under the auspices of the Plant Gene Expression Center headquartered in Albany, California, researchers from both institutions collaborate based on their common interests in plant molecular biology and genetics research. Most PGEC researchers are also adjunct faculty in the College.

Meanwhile, the field of microbiology, which in the 1940s resided in the Department of Bacteriology and Immunology in the College of Letters and Science, no longer had cohesive influence on campus. Medical microbiologists worked in the School of Public Health, but other microbiology researchers were scattered among several departments and colleges.

In the late 1990s, CNR Professor Sydney Kustu approached then Chancellor Chang-Lin Tien with a proposal to revive the field of microbiology as a unit on campus. He agreed, and in 1996 the Division of Microbial Biology was established and combined with plant biology to form the Department of Plant and Microbial Biology.

This group remains at the forefront of research on photosynthetic processes and products, plant molecular biology, plant genomics, plant-microbe interaction, microbial biology, and plant physiological processes. Six faculty members have been elected to the prestigious National Academy of Sciences.



(Left to right) Mary Belle Allen, Dan Arnon, John Capindale, and Bob Whatley look at cultures of cyanobacteria as part of photosynthesis research, circa 1956.

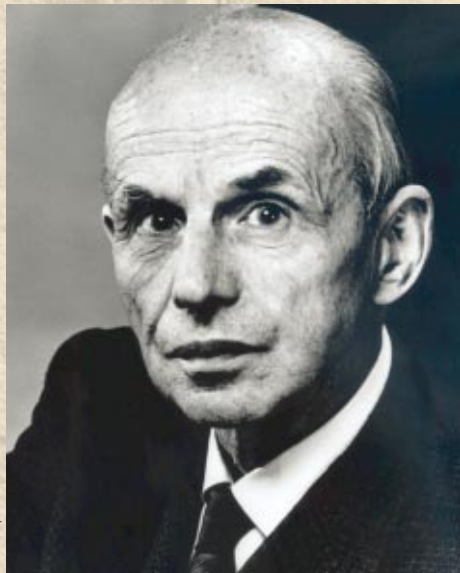
Courtesy of Bob Whatley

Some of the faculty's accomplishments include:

- First to isolate a bacterial gene that triggers a defensive response in plants
- First to gain federal approval to run a field experiment using genetically modified bacteria
- Discovered a primary means by which plants sense light to regulate enzymes of photosynthesis
- Discovered genes that help plants resist disease
- Established the field of fungal molecular ecology
- Discovered the mechanism by which bacteria regulate the fixation and utilization of nitrogen
- Elucidated the signaling pathway by which plants perceive day length and use light in their development
- Established the preeminent program for developmental genetics of an economically important plant, maize
- Devised a system for the efficient production of hydrogen gas by algae
- Discovered that asexual fungi are recombining in nature
- Discovered how the crown gall bacterium transfers its DNA into the plants it infects, opening the door for widespread use of the bacterium to genetically engineer crop plants
- Contributed to the sequencing of the first complete genome, of the mustard *Arabidopsis*.

And as with other areas of the College, Plant and Microbial Biology is committed not only to research but to education and outreach. In 1991, Peggy Lemaux joined the College as the first Cooperative Extension specialist in biotechnology in the nation. Her role is to explain the new frontiers of agricultural biotechnology to the public. "We need to help the public understand why what we do is so important," said Lemaux.

Highlights of Excellence



Hans Jenny



Professor Ron Amundson sampling rock in the Atacama Desert of Chile.

From the Ground Up: Revealing the Science of Soil

"Berkeley is to soils as London was to the development of biology or geology: if you want to study soils, Berkeley is the place to go," said CNR soil scientist and professor Ron Amundson. That's because Eugene Hilgard was not only the father of what is today the College of Natural Resources, but he founded soil science as a distinct academic field of study in the United States.

Hilgard, born in Germany but reared on the American frontier (then Illinois), was largely educated by his parents and family in his early life, spoke four languages and read several more, and ultimately gained widespread interest and education in chemistry, biology, and geology. Before he came to Berkeley, as the State Geologist of Mississippi, Hilgard published a landmark report on the geology and soils of the state that clearly set the stage for the study of soils as a separate branch of scientific knowledge. For both his agricultural and geological research, he was elected to the National Academy of Sciences in 1873, though much of his career still lay ahead on the fledgling Berkeley campus.

In 1875, Hilgard joined the College of Agriculture as a professor of agriculture and botany. He first put the new College on the national scientific stage in 1884 through his Cotton Census for the Southern States and California. Although focusing on cotton, the report served as the first synthesis of the soil geography of California, including its first agricultural map. His outline of the geographical/soil provinces of the state is still used today.

During this time, Hilgard provided the first general framework explaining the roles of salts and sodium on crop production and water infiltration, research inspired by his contact with agricultural constituents in the state. He determined that applying gypsum would remediate sodic soils and improve their structure and hydraulic characteristics, chemical principles that remain applied globally to this day.

Under Hilgard, University instruction was made available in soil chemistry, soil physics, and in the genesis and classification of soils. By 1913, soil science courses crossed three divisions in the College: agricultural chemistry, soil chemistry and bacteriology, and soil technology.

"Courses still taught on the Berkeley campus originate from those first taught by Hilgard in the late nineteenth century," said Amundson.

In addition to his Cotton Census work, Hilgard moved in other directions, including the role of climate on soil formation, including temperature and moisture, and the correlation between arid and humid soils.

Other important soil scientists of the early program included Earl Storie and Hans Jenny. In 1934, Storie published the now classic agricultural land rating system based on soil properties. His system became known as the Storie Index, and is still used today to rank soils for their productive potential. The Index also has continued present day use in land appraisal, tax assessment, and land-use planning.

In 1936, Jenny joined the faculty and made significant contributions to the fields of colloid chemistry, ion exchange, and pedology. His signature work was the 1941 book





Factors of Soil Formation, which virtually revolutionized the conceptual and quantitative view of the terrestrial world.

“No soil scientist in the history of the College—including Hilgard—commands greater international recognition than Hans Jenny,” said Amundson.

Throughout his life, Jenny’s scientific contributions were driven by a true love of the soil, combined with a cool, analytical skepticism. In retirement, which spanned nearly 25 years, he turned his passions to protecting rare soil ecosystems. Using his training in and love of art and nature, he became an important advocate of stewardship and conservation. His efforts led to the creation of Jug Handle State Reserve near Caspar, California.

With an expanded scope including soil physics and soil chemistry, the Division of Soil Technology was elevated to the Department of Soils in 1951. In 1955, the soils group merged with the Department of Plant Nutrition to form a two-campus Department of Soils and Plant Nutrition at Berkeley and Davis, led at the time by Jenny. The two sections of the department became autonomous on their separate campuses with the 1964 appointment of separate chairs.

In the midst of these reorganizations, Hilgard’s legacy of a stellar soil science program continued. In the 1950s, Professor Roy Overstreet and his graduate student, Kenneth Babcock, formed a team that would gain international recognition for their work bringing together the fields of soil colloid chemistry and chemical thermodynamics. Babcock’s first Ph.D. student, Garrison Sposito, today continues this long-standing tradition (see Faculty and Specialists/Awards).

In 1951, soil scientist and chemist Douglas McClaren joined the faculty and helped launch the field of photobiology. He conducted pioneering experiments to quantify the role that microbes play in moving nitrogen through the soil, a field today strongly represented and advanced by Professor Mary Firestone.

In the 1980s (see Plant and Microbial Biology) the Department was renamed Plant and Soil Biology, though in 1988, it was again renamed the Department of Soil Science, reflecting its long history and ongoing vision. As part of a major CNR academic reorganization in the 1990s, the department was dissolved and its faculty merged with the Department of Environmental Science, Policy, and Management.

“At Berkeley we have an incredibly rich heritage in basic soil science research,” said Amundson. He notes that the College is also well prepared for the application of soil science to a broad array of environmental issues.

“In our College, we have scientists looking at carbon at all levels, from molecular scales at mineral surfaces, to soil microorganism metabolism of organic compounds, to carbon storage and release, to the atmosphere at regional and global scales. With soils holding more carbon than the entire world’s vegetation and the atmosphere combined, the carbon cycle is clearly a field where soil scientists will continue to be very important,” he said.

The College’s soil scientists reside in the Division of Ecosystem Sciences in the Department of Environmental Science, Policy, and Management. 🚩



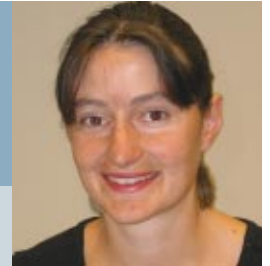
Faculty and Specialists

NEW FACULTY

Max Auffhammer



Eileen Hebets



Assistant Professor **Maximilian Auffhammer** says his academic path was a process of discovering his interests: a bachelor's degree in environmental sciences from the University of Massachusetts, Amherst, led him to explore resource economics; he earned a master's degree in econometrics from the same university. He went on to earn a Ph.D. in economics from UC San Diego. Now he joins the faculty at CNR's Department of Agricultural and Resource Economics.

Auffhammer studies the role of developing countries in climate change, with a special focus on China. The rapid economic and industrial development of that country has resulted in growing emissions of greenhouse gases from the burning of coal, and an increasing reliance on imported oil. He notes that per capita ownership of automobiles is about one percent of that in the United States, but sales increased by nearly 70 percent last year. A major challenge is to update China's power generation facilities from inefficient, Cold War-era coal-based electricity sources to state-of-the-art facilities—a transition that is well underway in the coastal provinces.

The country's severe air pollution problems have tremendous implications for public health. They are focused on clearing up the air for the 2008 Summer Olympics, because of concerns that the air quality is so poor it could affect athletes' performances.

Some of Auffhammer's recent work includes the first forecasts of Chinese carbon dioxide emissions based on province-level data, which provide some insight into what the potential causes of increased emissions will be over the coming decades. He believes that developing countries will play an important role in affecting climate change. The largest challenge, he says, is to figure out how countries can raise the standard of living while limiting negative environmental consequences.

And the excitement, he says, is in watching such a dynamic economy evolve. "The speed of socioeconomic, political, and technological change we are observing in China has no precedent in recent history," said Auffhammer. "It is an exciting time to study these changes and Berkeley, with the large number of world-renowned faculty experts on these issues, is the perfect place to do so."

When set designers for the movie *Spiderman* wanted to know what a working spider laboratory looked like, they contacted **Eileen Hebets** and a colleague at the University of Arizona—and received in return several boxes of posters and lab materials that ended up scattered around the movie set. The experimental spiders in the movie are housed in boxes exactly like the ones Hebets herself designed for lab use.

Hebets is now an assistant professor in the Division of Insect Biology. She joins the faculty from Cornell University. Hebets earned an undergraduate biology degree from Albion College, a master's degrees in biology from the University of Cincinnati, and a master's degree and Ph.D. in ecology and evolutionary biology from the University of Arizona.

Hebets studies complex signal evolution in arachnids and focuses mostly on the courtship displays of the wolf spider genus *Schizocosa*, as well as the potential for sexual selection to drive the rapid diversification of jumping spiders in the Southwest.

Some of Hebets' recent research on wolf spiders led to the discovery that young females, after being exposed to older males with different types of ornamentation, later preferred the same phenotypes when choosing a mate. This was one of the first examples of social experiences influencing adult mate choice in an arthropod. She plans to continue experiments that examine social exposure and memory of spiders.

Hebets also seeks to learn more about the little-known arachnid order Amblypygi (whip spiders). Amblypygids are nocturnal arachnids found in the tropics and subtropics. They have eight legs, but only walk on six of them; the front two are long, modified legs covered with sensory hairs. These legs are similar to the antennae of insects and contain giant inner neurons of an undetermined function.

Studying these virtually unknown arachnids means that Hebets has many opportunities for groundbreaking work, such as her discovery that a Florida Keys species of Amblypygid can breathe underwater.

"For some of these species, I'm probably the first person to ever see their courtship and mating," Hebets said. "Almost everything I do is new, and it's really exciting"



Max Moritz

Max Moritz joins the College of Natural Resources as the nation's first Cooperative Extension specialist devoted to wildland fire. As part of the Department of Environmental Science, Policy, and Management, he will work closely with the College's Center for Forestry.

Moritz earned his Ph.D. in spatial ecology from UC Santa Barbara. His doctoral thesis looked at the relationships between fire, weather, and chaparral vegetation in the Los Padres National Forest, and how fire suppression may have altered the ecosystems. He holds a bachelor's degree in management science from UC San Diego and a master's degree in energy and environmental studies from Boston University.

He has broad expertise in fire modeling, fire effects, brushland fire ecosystems, and spatial patterns of fire disturbance. In addition to continuing his own fire management and ecology research, Moritz will serve as a link between faculty researchers and county Cooperative Extension advisors. He will also provide direct links with professional resource managers, landowners, policymakers, and a diverse array of public and private organizations on issues related to fire.


"We develop and live on fire-prone landscapes, and our population is growing—so that development is going to increase," Moritz said. "Given that fire is such an important mechanism, research and outreach related to fire is crucial."

Before joining UC Cooperative Extension, Moritz was an assistant professor of geography at California Polytechnic State University in San Luis Obispo.

The large wildfires of 2003 burned primarily in shrubland forests, Moritz's specialty. Those fires generated national debate about what drives intense wildland fires, including fuel control strategies and their effectiveness.

"It's an interesting time to be studying these topics, because there's a lot of excitement about what fire suppression may have done in different ecosystem types," he said.

Due to ecosystem variation and unique drivers such as the Santa Ana winds, "there's no one-size-fits-all solution to this issue," Moritz said. "It is a natural, recurring hazard in our landscape. We just have to learn to live with fire."



Kathleen Ryan

Kathleen R. Ryan was convinced she wanted to be a doctor. So after earning her undergraduate degree in History and Science from Harvard University, she went on to the Medical Scientist Training Program at Johns Hopkins University School of Medicine, where she eventually earned her Ph.D. in biochemistry and molecular biology.

Medical training, Ryan says, taught her that her real love wasn't medicine—it was science, and cell biology in particular. She had been interested in cell biology since an introductory course at Harvard, cotaught by molecular and cellular biologist Howard Berg and Berkeley alumnus and former botany professor Daniel Branson (Ph.D. in plant physiology, 1961).

Ryan has now joined the Division of Plant and Microbial Biology, fresh from postdoctoral research at Stanford University's Department of Developmental Biology. Her current work focuses on *Caulobacter crescentus*, an aquatic bacterium that enters two distinct phases over the course of its life cycle. *Caulobacter* starts out as a mobile "swarmer" cell with a polar flagellum, then differentiates into a stalked cell that then produces more swarmer cells.

Ryan says she was drawn to study *Caulobacter* because its cell cycle allows her to grapple with broader questions, such as how cells organize themselves and move their internal components. She is particularly interested in temporary cellular regulatory events, such as protein degradation and localization, and the establishment of polarization within the cell.

Although cell biologists frequently examine the workings of plant and animal cells, bacterial cells have not received the same level of scrutiny—probably, Ryan says, because technology only recently improved enough to allow close study of bacteria's tinier structures. "I think people are surprised at how organized the insides of bacteria are," Ryan said. "There are plenty of old biology textbooks that describe bacterial cells as bags of enzymes, and that is really not true."

Her long-term goal is to explore how bacteria control cell cycle progression and how they achieve asymmetric cell division. Ryan also hopes to establish collaborations to develop new antibiotics that inhibit the natural cycles of bacterial cells. 🚩

—Kelly Hill

Faculty and Specialists

AWARDS



Inez Fung

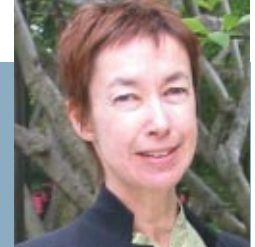


Frank Sposito

Garrison Sposito



Rosemary Gillespie



Patricia Zambryski

Two Faculty to Receive High Honors from American Geophysical Union

Inez Fung and Garrison Sposito have been selected to receive medals of accomplishment from the American Geophysical Union, the world's largest society of Earth scientists. AGU will present both medals at their annual meeting in December in San Francisco.

Fung, climate change pioneer

Inez Fung, one of the world's pioneering researchers on global climate change and the Earth's carbon cycle, will receive the Revelle Medal "for excellence in research contributions to the atmospheric, oceanic, and terrestrial disciplines, and her strong scientific leadership."

Fung is a professor in the College of Natural Resources' Department of Environmental Science, Policy, and Management and in the College of Letters and Science's Department of Earth and Planetary Science. She joined the UC Berkeley faculty in 1993 as the first Richard and Rhoda Goldman Distinguished Professor for the Physical Sciences and is the founding director of the Berkeley Atmospheric Sciences Center.

In 1990, she deduced that the terrestrial biosphere has been absorbing a large fraction of the atmospheric carbon dioxide from fossil fuel combustion. Though controversial at the time, the terrestrial carbon sink has since been confirmed and has become a central negotiation theme in international protocols.

Fung is the acknowledged pioneer and principal architect of the field of Earth System Modeling, where the complex physical, biological, and chemical reactions on Earth are distilled into mathematical equations—to be solved on the fastest computers—to predict the evolution of Earth's climate. Her current research is focused on whether global warming will be accelerated through destabilization of carbon storage in the biosphere.

In 2001, she was one of three women Berkeley faculty members (in a class of 72) elected to the prestigious National Academy of Sciences.

Sposito, expert in soil processes

Garrison Sposito will be awarded the Horton Medal "for his seminal and extensive contributions in establishing the physical and chemical foundations of hydrology." The Horton Medal was established in 1974 in honor of famed hydrologist Robert E. Horton's contributions to the study of the terrestrial water cycle.

Sposito is a professor in the Division of Ecosystem Sciences in the College of Natural Resources and in the College of Engineering's Environmental Engineering program. He is considered among the top researchers in the fields of both environmental geochemistry and hydrology.

Sposito was the first Ph.D. student of CNR professor Kenneth Babcock.

Babcock, along with fellow CNR professor Roy Overstreet, gained international recognition for studies bringing together the fields of colloid chemistry and chemical thermodynamics as applied to soils, work which Sposito continues today in his most recent book, *The Surface Chemistry of Natural Particles*. His research on hydrologic processes in soils seeks to establish the physical foundations of mathematical theories that describe water, solute, or energy transport.

Sposito is also recognized by colleagues and students for his generous research collaboration and dedication to teaching. He offers a unique course, "Introduction to Environmental Studies," along with Robert Hass, Professor of English and former U.S. poet laureate (1995-1997), that brings together environmental science and the humanities.

Insect Encyclopedia Wins Award

The Encyclopedia of Insects received the 2003 award for Outstanding Single Volume Science Reference Book by the Association of American Publishers. CNR professor of entomology Vincent Resh and Ring Carde, professor and chair of the Entomology Department at UC Riverside, edited the encyclopedia. Fifteen Berkeley faculty were among the more than 250 authors that contributed to the book.

Gillespie to Continue as Essig Museum Director

CNR professor Rosemary Gillespie has been appointed to a second five-year term as director of the Essig Museum of Entomology, beginning in July 2004. The museum contains more than 5 million specimens of terrestrial arthropods, collected over time since the 1880s.

In 1991, the museum received funds to upgrade and move the Essig Museum collection from Wellman Hall into the Valley Life Sciences Building. The funds will be used to upgrade storage for the collection and to provide technical support for the relocation. Eleven faculty, in addition to Gillespie and Jerry Powell, have been appointed as curators. These faculty members, together with their students and postdocs, have expanded the taxonomic range of the museum to include moths and butterflies, beetles, wasps, bees and ants, true bugs, and spiders and ticks.

Zambryski is 2004-2005 Miller Professor

Patricia Zambryski, professor in the Department of Plant and Microbial Biology, has been awarded a Miller Research Professorship for the academic year 2004-2005. Zambryski will continue her research on two different projects aimed at understanding (1) how plant cells communicate with each other via intercellular channels called plasmodesmata, and (2) structure and function of the type IV secretion channel utilized by *Agrobacterium* to transport DNA through its membranes into susceptible plant host cells.

College Support

HILGARD SOCIETY

Appropriately named after one of the early founders of our College, the Hilgard Society recognizes our most generous donors to the Berkeley Fund for Natural Resources. Because gifts to this fund are made without use restrictions, they benefit virtually all areas within the College, from student and faculty support to program development and research. One of the primary programs to benefit from the annual fund is the Undergraduate Research Opportunities Program. In 1875, Eugene Hilgard's vision for the College was to bring the highest caliber of science to bear on practical problems and use this knowledge to train the next generation of leaders. Today, the Hilgard Society allows this vision to be carried into the future. Thank you.

Hilgard Society members are donors to the Berkeley Fund for Natural Resources whose cumulative giving is \$250 or more annually. As we transition from a fiscal to a calendar year, please note that the following list is based on cumulative giving for the period of July 1, 2002 through December 31, 2003.

Thanks again to all the members of the Hilgard Society for their commitment and support.

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Recent Alumna Supports CNR

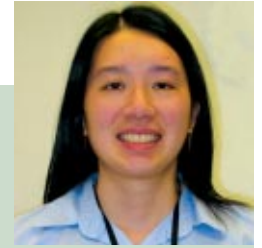
Diane Yu, '96 (B.S., Nutrition) says she owes her present job as a research assistant with Lockheed Martin at NASA Ames Research Center to the College and to Cal. "Berkeley is a top tier school. I know that gave me an advantage here," Yu says.

And the research and laboratory management parts of her position stem directly from her laboratory experience at CNR. Although she studied to be a dietician, an eight-month technician position with Professor Fernando Viteri led her to research.

"Dr. Viteri was looking at iron supplements in pregnant females. It was very interesting and he taught me a lot about research—that was the reason I decided to go into research instead of becoming a dietician."

After graduating from CNR in 1996—making her among the most recent graduates belonging to the Hilgard Society—Yu obtained an M.S. in Nutrition from Chico State University. While her current job doesn't rely on her nutrition education, it fits in with the research. She tests biological equipment for use in space.

As a donor, Yu takes advantage of the matching program at her company. "Lockheed matches dollar for dollar every donation I give to an accredited university. I didn't realize that until the person who called to ask me for a donation to CNR pointed it out."



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TRIBUTE TO DANIEL ARNON: 50TH ANNIVERSARY OF KEY PHOTOSYNTHESIS DISCOVERIES

On March 1, plant biochemist **F. Robert Whatley** returned to Berkeley after 40 years to honor the memory of Professor **Daniel Arnon** and to celebrate the 50th anniversary of their discoveries on plant photosynthesis.

To a full house in 101 Barker Hall, Whatley recounted what was known about chloroplasts and photosynthesis in 1953. "We knew that ATP was important in photosynthesis and also that chloroplasts produced starch."

The common scientific view at the time was that photosynthesis depended on both chloroplasts and mitochondria. It was generally believed that chloroplasts merely produced a reductant that allowed for generation of ATP in the mitochondria. ATP (adenosine triphosphate) is a molecule that carries cellular energy in all organisms.

"We had difficulty accepting this view, because there were not enough mitochondria present to account for the amount of ATP that was needed," he said. "We deduced that chloroplasts themselves must be able to use light to make ATP."

In 1954, after isolating whole chloroplasts from spinach leaves, Arnon, Whatley, and **Mary Belle Allen** discovered photosynthetic phosphorylation, the process by which chloroplasts use the energy from sunlight to synthesize ATP. They also demonstrated for the first time that complete photosynthesis could occur in whole chloroplasts outside the cell, establishing chloroplasts as the only cellular organelle necessary for photosynthesis.

"We had positive results on our first try, which was very satisfactory," Whatley noted.

Scientific acceptance of their work, however, came only after several years of discussion and further research.

Arnon and his team, including several graduate students and postdocs, went on to discover other important aspects of photosynthesis, including the role of chloride, plastoquinone, and ferredoxin.

In their initial discoveries, oxygen served as a catalyst for the chemical reactions, but the team later found how the process could be accomplished anaerobically. They also experimentally separated the light and dark phases of photosynthesis. Ferredoxin was one of the first in a new class of iron-sulfur electron carriers present in a wide variety of organisms. This protein is required for the accumulation of the reductant (NADP) and ATP needed for complete photosynthesis.

Although his group contained at most 20 individuals at a time, numerous students and postdocs trained in his lab rose to positions of national and international importance in research and academia, and his legacy of research on photosynthesis continues to this day.

Dr. Whatley's talk was given as part of the Daniel I. Arnon Memorial Lecture series, established in 2000 by the Department of Plant and Microbial Biology. The Department is fortunate to hold several annual lectures like the Arnon program, including the Tsujimoto and Buchanan lectures, which are sponsored by the K/T Foundation of San Francisco.



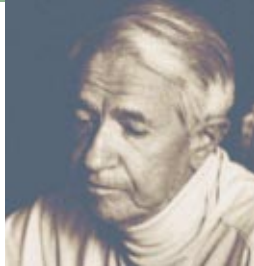
(Left to right) Stephen Arnon, Harry Tsujimoto, Bob Whatley, Bob Buchanan, Lawson Rosenberg

* Deceased

GUMP STATION CELEBRATES 20 YEARS IN MOOREA



For two decades, UC Berkeley has offered a unique venue for students and researchers to study science and culture in the tropics: the Richard B. Gump South Pacific Research Station on the island of Moorea.



Moorea, a 1.2-million-year-old volcanic island, is one of the Society Islands of French Polynesia. Located 14 kilometers northwest of Tahiti, Moorea has freshwater streams, forest-cloaked mountains, a well-developed coral reef and lagoon system, and a rich cultural history. The Gump Station is UC's only research facility in the tropics as well as its only international field station.

In 1977, Mr. Richard Gump of Gump's San Francisco began conversations with the Berkeley campus administration about donating his spectacular property overlooking the entrance to Cook's Bay on the north coast of Moorea. Mr. Gump was an extraordinary individual—a renaissance man—with a great love of Polynesia, its people, and natural ecosystems. After four years of planning and negotiation with the local government, the land was transferred to the University and Mr. Gump funded the first building—still the station's principal dormitory on the waterfront.

The station was named in 1984 and its administration moved from the Chancellor's Office to its present home in the College of Natural Resources. The following year the station was officially inaugurated at a March 9 ceremony in Moorea. It subsequently has flourished under three faculty directors: professors Werner Loher, Vincent Resh, and since 2001, George Roderick.

The young station was able to grow thanks to the continuing support of Berkeley alumnus Gordon Moore, his wife Betty, and their family, whose gifts have enabled the station to become one of the world's premier tropical research facilities. The Gump Station has many other generous friends, including Jerry McClaine, Dwight Barker (Chair, UC Berkeley Foundation), and Don Raymond (CNR Advisory Board member), who have worked tirelessly on the station's behalf.

Today, the 35-acre Gump Station can house up to 35 students and researchers. The most recent donation from the Moore Family Foundation is helping the station to meet an ever more rapidly growing demand for teaching and research facilities. These funds have also facilitated a major new outreach initiative with the people of Moorea: the Atitia Center is a partnership between the University, the Mayor of Moorea, and a community-based organization, Association Te Pu Atitia. The aim of this effort is to document, preserve, and promote the biological and cultural heritage of Polynesia.

"The Gump Station is an ideal venue for students to learn about tropical environments and societies," according to Roderick, an insect population biologist. "As an island, Moorea is a model system for addressing crucial global questions, such as how climate change and globalization affect the dynamic relationship between humans and their natural environment—a new field known as biocomplexity."

One of the outstanding features of Moorea is its coral reef lagoon; the warm protected waters provide an ideal laboratory for marine research and education. But the Gump Station is not solely a marine lab, Roderick noted. As a hot-spot archipelago, the Society Islands are well situated for studies in evolutionary biology and biodiversity science. Furthermore, Moorea has renowned archaeological sites and has been an active location for anthropologists.

"Moorea is a window into a unique environment," said Roderick. "The station gives students an experience impossible to replicate in a conventional classroom and the island provides researchers with an incredible natural laboratory."

For more information about the Gump Station, visit <http://moorea.berkeley.edu>. An oral history of Richard Gump is also available at Berkeley's Bancroft Library.

—Kelly Hill



CLASS OF 1974: THE FIRST GRADUATES OF THE COLLEGE OF NATURAL RESOURCES

In honor of this special 30th anniversary, *Breakthroughs* is proud to present the first graduating class of the College of Natural Resources. Please use the enclosed Class Notes form to let us know how you're doing!

Agricultural Chemistry

Kathleen J. O'Hare, B.S.

Agricultural Economics

John R. Evers, B.S.
David M. Huston, B.S.
Kong V. Kong, B.S.
Dr. Beverly Downing Penzien, B.S.
Jong W. Chung, M.S.
Leo H. Ellis, M.S.
Alfred Muller, M.S.
Walter R. Ross, M.S.
Dale E. Squires, M.S.
Sumter L. Travers, Jr., M.S.
Stephen O. Andersen, Ph.D.
Mark R. Gustafson, Ph.D.
Darrell L. Hueth, Ph.D.
Wesley N. Musser, Ph.D.
Peter W. Wyeth, Ph.D.

Agricultural Science and Management

Dr. Robert J. Ahrens, B.S.
Rolan P. Akers, B.S.
David A. Beveridge, B.S.
Douglas W. Canete, B.S.
Michael D. Cohen, B.S.
Winston P. Dea, B.S.
Elizabeth Yeaman Dozor, B.S.*
Michele Marchese Gibbs, B.S.
Martha Johnson Gillespie, B.S.
Joel H. Grossman, B.S.
Dr. Sally Burger Hayati, B.S.
Wen H. Hsieh, B.S.
Karen Roth Knopf, B.S.
Karen S. Kwok, B.S.
Damon Lee, B.S.
Gregory Li, B.S.
Leanne Morinaka Maru, B.S.
Darryl L. McLeod, B.S.
Dr. Dennis D. Murphy, B.S.
Gerald I. Nishikawa, B.S.
Bruce E. Quan, B.S.
Christine N. Quan, B.S.
Linda Ingham Rummel, B.S.
Catherine Sipe Shaul, B.S.
Mark A. Simko, B.S.
John H. Slater, B.S.
Stanley Turner, Jr., B.S.
Daniel E. Vaughn, B.S.

Kerwin K. White, B.S.
Arthur P. Wong, B.S.
Dr. Devon Zagory, B.S.
Gamalat A. Abdel-Latif, M.S.
Benjamin Graham, Jr., M.S.
John T. Scholz, M.S.
Richard E. Yescott, M.S.
Eleni Zanni-Economou, M.S.
Gary L. Piper, Ph.D.

Conservation of Natural Resources

Dr. Mark R. Abbott, B.S.
Flemming Badenfort, B.S.
Kathleen F. Bain, B.S.
Dwight C. Baker, B.S.
Steven S. Balling, B.S.
Ronald D. Barngrover, B.S.
William L. Bart, B.S.
Diane M. Battilana, B.S.
Mary A. Benton, B.S.
John A. Berry, B.S.
William J. Birt, B.S.*
Richard E. Blake, B.S.
Richard H. Blum, B.S.
Jeffrey T. Boyer, B.S.
Jeffrey W. Boyes, B.S.
Antoni Bozynski, Jr., B.S.
Carol Dehart Briggs, B.S.
John A. Brownson, B.S.
Lisa Bud-Frierman, B.S.
Josephine M. Bunn, B.S.
Charles Burton, B.S.
Charles D. Butler, II, B.S.
Steven A. Calish, B.S.
Eric P. Carr, B.S.
Michael H. Chin, B.S.
Willis K. Choy, B.S.
Dorothy A. Cole, B.S.
William E. Combs, B.S.
Paula Riordan Connelly, B.S.
Lauren H. Coodley, B.S.
Thomas S. Corse, Jr., B.S.
Gary R. De la Rosa, B.S.
Nona Donahue, B.S.
Michael E. Dubrasich, B.S.
Samuel B. Earnshaw, B.S.
Maryjo Effron, B.S.
Jane A. Ellis, B.S.
Jacqueline L. Faike, B.S.

Fassil Fessaha, B.S.
Jessica Fielden, B.S.
Robert M. Firth, B.S.
Vicki G. Fischer, B.S.
Constance Barnes Fisher, B.S.
Ann R. FitzSimmons, B.S.
April E. Fletcher, B.S.
Vernita P. Fort, B.S.
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Gary L. Fulcher, B.S.
Gayle M. Galloway, B.S.
Marilie D. Gammon, B.S.
Bruce F. Goines, B.S.
Kirk C. Gothier, B.S.
Louise Spalding Grandadam, B.S.
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David B. Griffin, B.S.
Kathleen G. Gundry, B.S.
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Dr. Ann E. Hajek, B.S.
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Carolyn B. Heath, B.S.
Sheila P. Higbif, B.S.
Shelley Kushnick Hubner, B.S.
Kenneth W. Huie, B.S.
Kerry Willmer Jackson, B.S.
Gwendolyn C. Jang, B.S.
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Robert E. Jaramillo, B.S.
Tom A. Javits, B.S.
Jeffrey D. Johnson, B.S.
Terry A. Jones, B.S.
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Sharon Blum Korotkin, B.S.
Ruth Schenck Kreshka, B.S.
Barry J. Le Ducq, B.S.
Joseph R. Longacre, III, B.S.
Hilary Ewing Lorraine, B.S.
Steve J. Love, B.S.
Gary K. Loy, B.S.
Malcolm A. MacFarlane, B.S.
Elisabeth M. Magnus, B.S.
Dr. Claire C. Magowan, B.S.
Ellen Maldonado, B.S.
Nadine D. Mandel-Toren, B.S.
Christin Church McCollum, B.S.

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Michael V. McMillan, B.S.
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Rei Miike, B.S.
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Gregory E. Moore, B.S.
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Dr. Lawrence K. Nelson, B.S.
Ruth A. Newman, B.S.
Christopher L. O'Brien, B.S.*
Brian A. Pace, B.S.
Raymond D. Pacheco, B.S.
Chris Papageorge, B.S.
Dr. Anne Z. Parker, B.S.
David A. Pelzer, B.S.
Debra J. Ragen-Coffman, B.S.
Frances A. Rappoport, B.S.
Daniel L. Robbins, B.S.
Dale A. Roberts, B.S.
Russell W. Rollins, B.S.
Michael E. Ross, B.S.
William C. Ross, B.S.
Richard T. Sander, B.S.
Suzi L. Sargent, B.S.
Dr. James M. Satt, B.S.
James B. Schaber, B.S.
Fayla C. Schwartz, B.S.
Steven R. Scott, B.S.
Edward J. Seifert, B.S.
Tana Hill Sholly, B.S.
Philip E. Sloan-Tierney, B.S.
Ronald W. Smith, B.S.
Donna Y. Smith-Marion, B.S.
Thomas C. Snipes, B.S.
Judith Hopkins Snyder, B.S.
Ruth Spaulding Sorensen, B.S.
Arthur L. Stackhouse, B.S.
Edward B. Sternstein, B.S.
Laurence J. Tenison, B.S.
Vicki Lynn Testa, B.S.
Clifford B. Thomas, B.S.
Debra Eglit Tidd, B.S.
Nancy Keane Tosta, B.S.
A. Robert Tulk, B.S.
Janet Gertler Tulk, B.S.
James G. Villeponteaux, B.S.
Robert C. Walsh, B.S.
Kevin C. Westfall, B.S.
Lindsay Wheeler, B.S.

* Deceased

David C. Whitehill, B.S.
Leslie Williams, B.S.
Randall B. Williams, B.S.
Alice S. Wong, B.S.
John G. Wong, B.S.
Patricia S. Young, B.S.
Kam Fong H. Yu, B.S.
Frank A. Zander, B.S.*

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Kathleen Oliver Carpenter, B.S.
Rebecca Ho Chen, B.S.
Patricia Yamamoto Christman, B.S.
Elizabeth Crocker O'Neill, B.S.
Laura J. Finkler, B.S.
Nancy C. Flynn, B.S.
Susan E. Foxton, B.S.
Constance Gabriel-Wilson, B.S.
Carol Ford Garberson, B.S.
Dorothy Nelson Giansiracusa, B.S.
Linda Meyer Hodge, B.S.
Pai-Hua Kuo Hsu, B.S.
Brenda Lee Irwin, B.S.
Helen A. Johnson, B.S.*
Margaret Humphrey Johnson, B.S.
Phyllis S. Lau, B.S.
Georganne C. Lawton, B.S.
Teresa Danieri McMahon, B.S.
Dr. Jan T. Okamura, B.S.
Craig A. Plumlee, B.S.
Vinette Pennisi Ramsay, B.S.
Madeleine K. Sui, B.S.
Sophia Fung Sum, B.S.
Lynn Muramoto Tso, B.S.
Carol Oaks Welch, B.S.
Carol Lee Yee, B.S.

Entomology

Marilyn J. Dechant, B.S.
Kathryn V. Freistadt, B.S.
Kim A. Hoelmer, B.S.
Richard A. Kimball, B.S.
John A. Morris, Jr., B.S.
Nelda A. Soderblom, B.S.
Rosser W. Garrison, M.S.
Val R. Landwehr, M.S.
Wellington A. Otieno, M.S.
Patrick J. Shea, M.S.
Arthur J. Slater, M.S.
E. Alan Cameron, Ph.D.
Roger E. Gold, Ph.D.
Robert S. Lane, Ph.D.
Richard W. Merritt, Ph.D.
Zaheer Parvez, Ph.D.
Guy D. Rajendram, Ph.D.
Soemartono Sosromarsono, Ph.D.

Frederick M. Stephen, Ph.D.
George J. Tsiropoulos, Ph.D.
Victoria Y. Yokoyama, Ph.D.

Forestry

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Lloyd L. Anderson, Jr., B.S.
Keith P. Arnold, B.S.
Dr. Keith B. Aubry, B.S.
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William C. Beckett, B.S.
John R. Benedict, B.S.
Timothy Biddinger, B.S.
Michael T. Brown, B.S.
John H. Burns, Sr., B.S.
Ann Paffenbarger Dow, B.S.
James M. Eckert, B.S.
Douglas C. Elliott, B.S.
Robert A. Gimbel, Jr., B.S.
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Kass Green, B.S.
Michael E. Groth, B.S.
Duane H. Harp, B.S.
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Randy J. Kahn, B.S.
Lawrence A. Leavitt, B.S.
Charlene A. Metz, B.S.
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Robert A. Obermeyer, B.S.
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Courtney M. Scandrett, B.S.
Steven P. Shiflett, B.S.
Jeffory A. Soto, B.S.
Craig T. Steggall, B.S.
Raymond G. Stine, B.S.
Raymond L. Tuttle, B.S.
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George T. Williams, B.S.
Michael W. Wolber, B.S.
Ramiro A. Morales, M. For.
James C. Pfeifer, M. For.
John M. Elliott, M.S.
Bruce D. Krogman, M.S.
Bruce E. Krumland, M.S.
James R. Olson, M.S.
Dr. B. T. Parry, M.S.
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James A. Venturino, M.S.
Michael E. Walraven, M.S.
Brian K. Wood, M.S.
King-Tsuen Wu, M.S.

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Kani Isik, Ph.D.
Conrad J. Krass, Ph.D.

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Dr. Darryl L. Kropf, B.S.
James R. Popplewell, B.S.
Dr. Matthew M. Winkler, B.S.
Roger C. Birosel, M.S.
Carol Thompson Reed, M.S.
Catherine Cragen McCombs, Ph.D.
Juan F. Villarroel, Ph.D.

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George W. Bain, B.S.
Thomas R. Batter, B.S.
Virginia H. Benson, B.S.
Patricia Benham Carlson, B.S.
Man-Wan Wong Chan, B.S.
Michael Chan, B.S.
Richard A. Cohen, B.S.
Thomas M. Cuff, B.S.
Lorri P. Dawson, B.S.
Ann M. Del Tredici, B.S.
Dr. Juan P. Delgado, B.S.
Emylyn L. Dohner, B.S.
Seid-Hossin Emami, B.S.
Gary R. Feldman, B.S.
Rose Y. Fong, B.S.
Helen Tsuboi Fukumoto, B.S.
Sheila Laughridge Hawthorne, B.S.
Cynthia Mock Hayano, B.S.
Janet L. Henick, B.S.
Thelma S. Ivu, B.S.
Dr. Sharon Korr, B.S.
Dexter S. Louie, B.S.
Clare Richards Lundgren, B.S.
Julia L. Mason, B.S.
Dr. Ronald Press, B.S.
Janice R. Spinner, B.S.
John P. Suzuki, B.S.
Meredith Grant Tallas, B.S.
Dr. Peter G. Tallas, B.S.
Dr. Laurel A. Waters, B.S.
Thelma S. Wu, B.S.
Linda Bair Smith, C. Phil
Janet Alberts Appel, M.S.
Arden Eisler Davidson, M.S.
Dr. Carl A. Goetsch, M.S.
Carolyn Moore Khourie, M.S.
Thierry A. Brun, Ph.D.
Catherine Tan Chan, Ph.D.
Janet B. McDonald, Ph.D.
Stanley G. Miguel, Ph.D.
Rajini P. Ranji, Ph.D.
Minnie R. Ruffin, Ph.D.

Barbara Olds Schneeman, Ph.D.
Tom R. Watkins, Ph.D.
Allison Y. Zezulka, Ph.D.

Parasitology

Kathleen H. Jeong, Ph.D.

Pest Management

Allan M. Phillips, B.S.*

Plant Pathology

Leonard L. Welch, M.S.
John J. Cho, Ph.D.
Dariush Denesh, Ph.D.
Thomas Duafala, Ph.D.
Ponciano M. Halos, Ph.D.
Joseph H. Hurlimann, Ph.D.
Jose R. Lastra, Ph.D.
John A. Muir, Ph.D.
Robert E. Paull, Ph.D.

Range Management

Peggy Robishaw Fox, M.S.

Soil and Plant Nutrition

Sheila Noe Hudson, B.S.
Michael L. Taylor, B.S.
Daniel R. Williams, B.S.
James T. Kam, Ph.D.

Soil Science

Eugene C. Duckart, B.S.
Kim C. Hayes, B.S.
Janice Darville Hess, B.S.
Jeffrey R. Higginbotham, B.S.
Mark P. Hite, B.S.
Bettie Buell Roof, B.S.
David E. Thomas, B.S.
John P. Reganold, M.S.
Giles M. Marion, Ph.D.
Adel M. Mohamed, Ph.D.

Wildland Resource Studies

Hernan J. Cortes, C. Phil.
Yoel Z. Alon, M.S.
Dr. Robert A. Ewing, M.S.
Henricus C. Jansen, Ph.D.

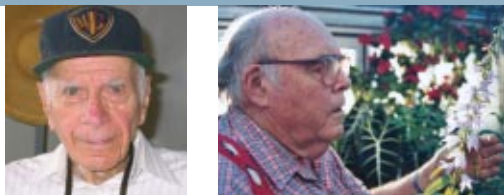
Wood Science and Technology

Vicente A. Molinos, M.S.
Andrew A. Pohlman, M.S.
Tseng S. Lee, Ph.D.
Leslie C. Palka, Ph.D.*
Jan Stofko, Ph.D.

* Deceased

HISTORICAL REFLECTIONS

RESEARCH-LOVING EMERITI
STILL WORK IN THE LAB



A chance laboratory arrangement more than 50 years ago led to scientific collaboration and a lifelong friendship between emeritus professors **James Vlamis** (above, left) and **Robert Raabe**.

Although they were in different departments, Raabe's plant pathology lab adjoined Vlamis' soil science lab. Raabe, Vlamis recalled, "is about the friendliest guy I know, and gradually he found out what I was working on, and I found out what he was working on."

Their work fit together like seeds in a pod, Raabe focusing on plant diseases and Vlamis studying the soil chemistry that affected plant health. They collaborated on many projects over the years, such as one study that revealed the cause of a chrysanthemum disease known as red root. Other scientists suspected a pathogen, but Vlamis' and Raabe's work showed it was due to excess soil in the irrigation water.

Both men are still familiar faces at the College's greenhouse at the Oxford Tract. "We're both crazy," Raabe jokes, "because we've been retired for years, and we both still come to work every day"

They say their reasons are simple, and the same. "We like what we do," Vlamis said. Raabe's lifelong love of plants stems from a \$1.25 mail order package of 37 plants that, as a young boy, he ordered after hearing a radio advertisement. Most of the plants, Raabe recalled, were common ones—except for two gladiola seeds. One died. The other bloomed so magnificently that it inspired his lifelong love of plants. "It was taller than I was, and it was a beautiful red spike—and I was hooked," he said.

Vlamis not only taught at the College, he was a student here, earning a B.S. in Forestry in 1935 and a Ph.D. in Plant Physiology in 1941. He discovered soil science while studying for his undergraduate degree in forestry. Dr. Alva Davis, the late plant nutrition and botany professor, and Dr. Dennis Hoagland, late professor of agricultural chemistry, inspired him to pursue the field of plant nutrition.

While they were teaching, Raabe and Vlamis together with D.E. Williams offered a class on urban garden ecosystems that showed students the basics of gardening. And after long and successful careers, Raabe, now 79, and Vlamis, now 89, still find their respective fields exciting.

"There's nothing better than finding out something new and interesting all the time," Raabe said.

—Kelly Hill

TO CAL AND CNR: THANKS FOR
THE GREAT EDUCATION



While reading your fall 2003 edition and a recent UC alumni publication, I noticed a comment of a recent graduate that she had enrolled at Cal as a freshman in spite of the warnings of "too big, too impersonal;" and found Cal to be quite the opposite.

I have reflected upon my own experiences at Cal in the College of Agriculture (now CNR) and the Berkeley campus. In those days (1938-1941) the Department of Plant Pathology was headed by Max Gardner, who also taught an upper division class in diseases of vegetables and field crops. As months and years went by, he was not only the professor, he became an important advisor and a good and valued friend.

We visited the greenhouses of Henry Severens and Julius Freitag, pioneers in the study of virus transmission by leafhoppers. Our exposure in other departments included classes with E. O. Essig (Insects of Western North America) and Dr. Lee Bonar (Botany), world renowned mycologist.

In other undergraduate courses: Physics 2AB included in the curriculum three lectures on atomic energy by E. O. Lawrence. Our section leader was William Fretter, who later became Vice Chancellor. Wendell Stanley visited the campus in 1938, and before an overflow crowd in Wheeler Auditorium, projected photomicrographs of tobacco mosaic particles, the first ever seen. Additionally, classes on economic theory by James Bennett and Sidney Hoos (Giannini Foundation) and Agricultural Labor Economics by Paul Taylor (Economics) were included.

All in all, a very impressive group of professors for one who turned out to be a fertilizer salesman! Was Cal too big and impersonal? Not for me! I have treasured this exposure and education!

Sincerely,

Robert Brownscombe, '41, B.S., Plant Pathology

DISTINGUISHED ALUMNI FROM THE COLLEGE OF NATURAL RESOURCES

The feature story in this issue focuses on the contributions of our faculty over the years. Just as important are the thousands of alumni who have left the College to provide leadership and expertise throughout the world. Just a few of our distinguished alumni are listed here.

John Kenneth Galbraith, '32, M.A., '34, Ph.D., Economics, is internationally known for his development of Keynesian and post-Keynesian economics as well as for his writing and his active involvement in American politics. His many notable positions include price czar during World War II; project director in the strategic bombing studies after World War II; editor at Fortune magazine; advisor to President Kennedy; U.S. Ambassador to India during the Kennedy Administration; a leader in the antiwar movement during the Vietnam War; and past president of the American Economics Association. He was awarded the 2000 Presidential Medal of Freedom.

Amihud Y. "Abe" Goor, '23, B.S., '25, M.S., Forestry, was Israel's director of forestry research from 1948 to 1955, Arid Zone Advisor to the Forestry and Forest Products Division of the Food and Agricultural Organization in 1955, and the only Cal Forester who served as a Regents Lecturer or Professor.

Ahmed A. Goueli, '62, M.S., Ph.D., '64, Agricultural Economics, served as Egypt's Minister of Trade and Supply, then as Secretary General to the Council of Arab Economic Unity. He is the winner of the 1998 Walter A. Haas International Award.

Kass Green, '74, B.S., Forestry, is former president of Space Imaging Solutions, one of the world's largest satellite imagery and geospatial service firms. Prior to joining Space Imaging, she was president and co-founder of Emeryville-based Pacific Meridian Resources, another GIS consulting firm. She is a nationally recognized forestry and remote sensing consultant with more than 25 years of experience in natural resource policy, economics, and GIS analysis.

Zvi Griliches, (deceased) '53, B.S., Agricultural Science; '54, M.S., Agricultural Economics, was a pioneer in measuring the economic impact of technological change in agriculture.

Philip Habib, '52, Ph.D., Agricultural and Resource Economics, was a career diplomat and personal representative of U.S. presidents and U.S. ambassadors to the Middle East, Korea, and Vietnam. He negotiated an end to Israel's 1982 siege of Beirut. His many honors include the 1982 Presidential Medal of Freedom, CAA 1982 Alumnus of the Year, and the Berkeley Citation for 1982.

Lawrence Klein, '42, B.S., Economics, won the 1980 Nobel Prize for the creation of econometric models and the application to the analysis of economic fluctuations and economic policies. He coordinated Jimmy Carter's economic task force in a successful campaign for Presidency of the United States.

Jennifer (Biddulph) Maxwell, '88, B.S., Nutrition & Food Science, is founder of Powerfood Inc. and creator of Powerbar with fellow Cal alumnus Brian Maxwell (deceased).

Steve McCormick, '73, B.S., Agricultural Economics, is President and Chief Executive Officer of The Nature Conservancy. Under his leadership, the California program became the leading conservation organization in the state, protecting more than one million acres of important natural areas.

Julius Menn, '54, B.S., '58, M.S., Ph.D., Entomology, served as associate director of the Plant Sciences Institute for the USDA/ARS in Maryland, and served as senior agricultural advisor to Turkmenistan on behalf of the U.S. Agency for International Development.

Emil Mrak, (deceased) '26, B.S., '28, M.S., '37, Ph.D., Agricultural Science, is internationally recognized for his work on the preservation of foods and as a world authority on the biology of yeasts. He served as Chancellor of UC Davis from 1959 to 1969, and was the CAA Alumnus of the Year in 1969.

Yair Mundlak, '57, Ph.D., Economics, made one of the first applications of decision theoretic framework to forecasting. He was the first full-time staff member in the department of Agricultural Economics at Hebrew University; under his ini-

tiative and leadership it soon became one of the leading departments of agricultural economics worldwide. He served as president of the Israel Foundation of Trustees from 1977 to 1988.

Norman Myers, '73, Ph.D., Interdisciplinary Studies, has been called "the Paul Revere" of the environmental movement. He is a leader in international efforts to save species at the brink of extinction by protecting their habitats, and he originated the biodiversity hot-spot strategy. He has acted as a scientific consultant and policy adviser to the White House, the U.S. departments of State and Defense, NASA, the World Bank, seven United Nations agencies, and the European Commission. He is the winner of the 2004 Haas International Award.

Lloyd Swift, (deceased) '27, B.S., Agricultural Science; '30, M.S., Forestry, received the Chief's Honor Award from the USDA Forest Service for a lifetime of dedication, commitment, and leadership in the wildlife and fisheries resources of the United States. As director of the Forest Service's Division of Wildlife Management, he had a major impact on wildlife management in the nation's forest lands. He served as executive officer of the U.S. appeal of the World Wildlife Fund and was a consulting biologist in Africa and the Middle East with the U.S. Agency for International Development and the United Nation's Food and Agriculture Organization.

Pinhas Zusman, '60, M.A., Statistics; '61, Ph.D., Agricultural Economics, has been recognized for the incorporation and measurement of social power in economic models. He was an advisor to the Agricultural Planning Center in Israel's Ministry of Agriculture, and served as director general of Israel's Ministry of Defense, vice president for Administration and Finance and director general at The Hebrew University of Jerusalem. He is a past president of the Israeli Economic Association.

CLASS NOTES

'39

Dr. John Morris Fenley, B.S., Forestry and Range; '48, M.S., Range and Forestry, has had his first book published. *Living with Multiple Sclerosis – A Caregiver's Story* discusses his 40-plus years of training and experience as a caregiver for his wife, Eileen Walker (also a Cal graduate).

'46

John M. Phillips, B.S., Forestry, says retirement is still great. He and his wife have been married 60 years, and, he says, "our small Indian artifact and antique business keeps us out of mischief." They have five children, eleven grandchildren, and seven great-grandchildren. The Phillips live in Eugene, Oregon, and John adds that the hatch string is always out for classmates passing through.

'58

Dr. Julius J. Menn, Ph.D., Entomology/ Toxicology, is currently consulting with the U.S. Department of Agriculture's Foreign Agriculture Service on food safety, and monitoring pesticides and mycotoxins in food and crops in Vietnam.

'67

George Jansen, B.S., Agricultural Economics, just had his first novel, *The Scrapbook of Jesse James*, published by Hilliard and Harris. Over the years, he has collaborated on technical books on computer languages, operating systems, and most recently, the suppression of spam.

'70

David Rentz, Ph.D., Entomology, recently retired from 24 years of service to the Commonwealth Scientific and Industrial Organisation in Australia. He is now living in Kuranda, Queensland.

'74

Dr. Henricus C. Jansen, M.S., Wildland Resource Studies, and '69, B.S., Forestry, is a charter member of the Northeast California Resource Advisory Council and a professor in rangeland management at California State University, Chico. He has most recently been working with the Bureau of Land Management conducting studies on the use of fire and other techniques to control invasive grasses on public lands.

Devon Zagory, B.S., Plant Pathology; '78, M.S. and '81, Ph.D., Plant Pathology, has a wife of 23 years, Ellen McEnroe, and an 18 year-old daughter, Jenny. He is the founder and owner of Davis Fresh Technologies, LLC, a fruit and vegetable consulting firm based in Davis, California, with offices in four countries and throughout the U.S. The firm offers services in produce quality and safety, supply chain management, international shipping, strategic planning and business development, and application of technology.

Matt Winkler, B.S., Genetics and '79, Ph.D., Zoology, spent a year after his '74 graduation traveling in Africa and waiting tables. He completed postdoctoral positions at the University of Hawaii and UC Davis, then took a faculty position at the University of Texas at Austin. After six years at the University, he started a biotech company called Ambion, which has grown to about 300 employees. He is married and has three sons.

'78

Mark Delfs, M.S., Forest Economics, retired from the U.S. Forest Service on Jan. 2. He is moving to Santa Fe, New Mexico.

Les A. James, B.S., Soil Resource Management, is dusting off his résumé and taking introductory computer classes for PCs and Macintosh.

'82

Dan Kalb, B.S., Conservation of Natural Resources, is now the California Policy Coordinator for the Union of Concerned Scientists, working on air quality, renewable energy, climate change, and clean transportation issues.

Paul E. Jacobs, B.S., Conservation of Natural Resources, serves as chief of Mobile Sources Enforcement for Cal/EPA's Air Resources Board in Sacramento, which strives to improve air quality for California residents.

'87

Laurie L. Williams, B.S., Conservation and Resource Studies, is now working in the U.S. territory of American Samoa as Pacific Islands Technical Assistant, building local capacity for geographic information systems (GIS) in coastal zone management.

'93

Binoj Joseph Matthew, B.S., Molecular Plant Biology, worked at Tularik, Inc. from 1993 to 1998 and was co-inventor on three biotechnology patents. He obtained a law degree from Southwestern University College of Law and worked as a law associate in Los Angeles. He started his own business and now owns and operates two state-licensed care facilities for the disabled. He is in the process of opening a state-licensed group facility for abused children.

'96

Sylvia Stone, B.S., Conservation and Resource Studies, completed a master's of environmental science from Yale University's School of Forestry and Environmental Studies in 2000. She has worked for three years as a program manager in international conservation for the Wildlife Conservation Society in New York and currently in San Francisco.

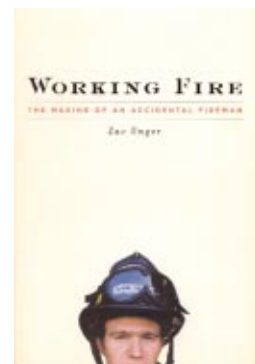
'00

Zac Unger, M.S., Range Management, became an Oakland firefighter. His book *Working Fire: The Making of An Accidental Fireman*, about his experiences as firefighter, has just been published by Penguin Books.

'01

Armaiti Khorshed May, B.S., Bioresource Sciences, is a third-year veterinary student at UC Davis.

Nadia Hamey, B.S., Forestry, is working as an assistant forester for Big Creek Lumber Company in Davenport, California.



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- **Reflections on the Endangered Species Act**

Read an interview with conservation biologist **Steve Beissinger** and resource economist **Dave Sunding** on the accomplishments and future of this important legislation. <http://nature.berkeley.edu/esa>

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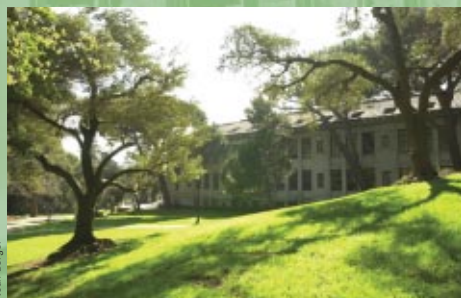


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HELP US Celebrate!

Join faculty, staff, students,
alumni, and emeriti at CNR's
30th anniversary party the night
before Big Game. Visit our web-
site later this spring for specific
information, or watch for an
invitation in the mail. We look
forward to celebrating with
you this fall!



Noah Banger

MAY 23, 2004

College of Natural Resources Commencement
Chancellor's Esplanade 10:00 a.m.
Featured Speaker: Paul Hawken

JUNE 28 - JULY 18, 2004

Beahrs Environmental Leadership Program

OCTOBER 15-17, 2004

Homecoming Weekend

Reunion Classes:

'44, '49, '54, '59, '64, '69, '74, '79, '84, '89, '94, '99

NOVEMBER 19, 2004

CNR 30th Anniversary Celebration